Australian Model Engineering

July-August 1999

Issue 85

$5.50*

NZ$7.50*
(inc. GST)

LOCOMOTIVES, TRACTION & STATIONARY ENGINES, BOATS, WORKSHOP, PRODUCTS, CLUB NEWS & EVENTS, REVIEWS

In This Issue:
- ☑ Edgeworth '99 — 43rd AALS Convention
- ☑ Model Speed Calculator
- ☑ Build a Versatile but Simple Blower

9 770819 473012 04

Print Post Approved, Publication No. PP228582/00001

*Recommended Retail Price

UE 712N BANDSAW

(7" x 12" capacity)

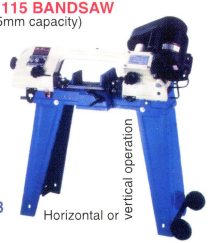
Complete with coolant and feed control

$1325.00

Horizontal or vertical operation

UE 115 BANDSAW

(115mm capacity)



$340.38

Horizontal or vertical operation

CQ 6123 BENCH LATHE

4-1/2" swing and 18" between centres

$1457.90

CQ 6230 ENGINE LATHE

$3287.90

Complete with stand and splash guard.

12" swing and 36" between centres.

ZX30 MILL-DRILL

$1647.00

Complete with

Drill Chuck
Face mill
Angle vice
3MT spindle
2HP motor
Reverse switch

Stand optional

VERTEX ACCESSORIES

Rotary Table

Dividing Head

Clamp Kit

VIP Catalogue OUT NOW
Phone for your copy.

4" Dividing head . .	$549.00	3MT 8 piece Collet Chuck set	$366.00
5" Dividing head . .	$720.72	5" Swivel Base Mill Vice . . .	$292.80
6" Rotary table . . .	$398.21	52 piece Clamping Kit	$183.00
8" Rotary table . . .	$539.24	Coolant pump kits from. . . .	$250.00
7 piece HSS Toolkit	$128.10	9 piece Tip tool kit.	$141.00

All prices include sales tax

TOLL FREE PHONE NUMBER: 1800 249 049

HMC
Herless Machinery Corporation

Melbourne Head Office
2099 Prices Highway
Clayton, Vic. 3168
Telephone: (03) 9562 8866
Facsimile: (03) 9562 8329

Perth Office
Unit 2/15 Brennan Way
Belmont, WA, 6104
Telephone: (08) 9479 6066
Facsimile: (08) 9479 6055
Email: herless@smart.net.au

Sydney Office
Unit 2/110-114 Asquith St.
Silverwater, NSW, 2128
Telephone: (02) 9748 3222
Facsimile: (02) 9748 1829
Website: www.herless.com.au

Australian Model Engineering

ISSN-0819-4734

Publisher: Australian Model Engineering Pty Ltd.

ACN 008 627 825

Australian Model Engineering is published six times per year at two-monthly intervals. January is the first issue for the year.

Subscriptions

An annual subscription to AME costs just $32 within Australia. NZ is AUD$40; all other countries, AUD$45 surface or AUD$50 air. You can pay by cheque, money order, or overseas bank draft. You can also use your Bankcard, MasterCard or VISA credit card. **All Mail to:**

PO Box 21, HIGGINS, ACT, 2615, AUSTRALIA

Phone/Fax : (02) 6254 1641 or + 61 2 6254 1641 from overseas

Printing and Distribution

Proudly printed in Australia for the publisher by Pirie Printers Pty Ltd, 140 Gladstone Street, Fyshwick ACT 2609

Australia Post Print Post Approved.

Publication No. **PP228582/00001**

Distribution is by subscription, through hobby supply houses and related-interest sales outlets, and by Gordon and Gotch Limited to newsagents in Australia.

July-August 1999 Issue 85

Contents

Front cover

Waiting in the bush for their next tour of duty, John Wood's 7306 and Craig Hill's 3805 are two nicely finished locos which really look the part at the Galston Valley Railway during one of the Hornsby club's scale running days.

Photo: Warren Williams

Australian Model Engineering

http://www.ameng.com.au

Crew

Managing Editor
David Proctor
Phone & Fax:.....(02) 6254 1641
(phone: leave message before 3pm)
e-mail:...ame@dynamite.com.au

Contributing Editors
Leigh Adams, Brian Carter, Neil Graham, Dave Harper, Clive Huggan

Assistant Editing
Murdoch Finlay, John Oliver

Draughters
Dave Adams, Craig Belcher, Dave Dunnett, Jim Gray, Peter Hall, Rod Heslehurst, Peter Kerville, Peter Manning, John Podmore, John Shaw, Rex Swensen, Zenon Zalewski

Keyboards and Distribution
Phyl Oliver

Contributors
Bruce Allen, Stan Allison, Ross Bishop-Wear, Rob Browne, Ron Calver, John Cummings, Peter Dawes, Melanie Dennis, Murdoch Finlay, Barry Glover, Jim Gray, Dave Harper, Terry Lane, Ian Smith, Roy Smith

Advertising
Brian Carter
Phone (6pm-9pm):....(02) 9649 5301
Fax (24 hrs):.... (02) 9702 0054
e-mail:.... brian@ameng.com.au

Subscriptions
Mandy Proctor.....(02) 6254 1641

Back Issues and AME Retail
Les Mouat: PO Box 355, Kooringal, NSW, 2650. Ph/Fax.....(02) 6926-4554

Publisher
Neil Graham .....(02) 4884 4324

Area Representatives
Western Australia
Doug Baker .....(08) 9341 1630
South Australia
John Wakefield ..... (08) 8362 3269
Victoria
Bill Taylor .....(03) 9458 3404
Tasmania
Jim Gray ..... (03) 6394 7124
ACT
Gerardus Mol .....(02) 6207 4011
New South Wales
Barry Glover .....(02) 4284 0294
Queensland
Dave Harper .....(07) 3261 1140
New Zealand
Murray Lane .....(09) 534 8396
Charlie Lear .....(04) 564 4049
Fax: (04) 564 2317
e-mail: clear@steammachine.com

Comment

Younger members — so what!

How often do we hear the cry of "How do we attract younger members to the hobby?" It seems to be a subject which surfaces very frequently in club newsletters, at rallies and whenever model engineers get together.

Recently I have been reading through some of the very early publications related to model engineering and guess what! For nearly a hundred years now, people have been wondering how to attract younger people to the hobby. Looking at the photos in the centenary book published by the SMEE in England, I noticed that nearly all the photos which chronicle the SMEE activities right through this century, show only older people in club activities.

I have read publications from other types of leisure activities, not at all related to model engineering, and they too seem to be worried about how to attract younger people. This would suggest that it is an area of concern to many people, worried about handing on the baton. What do we really need to do — indeed do we need to do anything. Maybe just doing what we are doing now will keep them coming, so long as we make them welcome.

Recently on the COALS Internet chat line, Larry Jorgensen from Victoria had this to say: *"Having read the worries regarding the future of modelling and live steam, I saw the ultimate answer to this question about 12 years ago. I took my family to the Lake Goldsmith steam rally. My kids at the time were 15, 8 and 7. I was doing the inspection routine while my wife did the mother thing. Next I heard "Hi Dad!" and looked up to see the 8-year old driving a traction engine with a 6ft wide smile. I asked the elderly driver if I could also have a go. I was not too politely asked to enjoy some sex and travel! I asked why and the answer was simple. "You saw these things as a kid and that's why you are here, but if the kids remember this, they will develop an interest to keep it alive for their kids, hopefully". Later in the day the 15-year old was driving a twelve-bullock team with his 7-year old sister. The 15-year old is now 27 and a toolmaker with a keen interest in steam. He has started on an 0-4-0 loco after acquiring a house, shed, lathe and wife. The kids still recount that it was one of the better days of their life."*

That, I think, really is a very good lesson. If we make our young visitors welcome and let them have a bit of a go, in the long term there should not be a problem. Fortunately, over the years there have always been some model engineers who were only too happy to foster this interest and the fact that the hobby continues, despite only involving "old" men for decades, is due in no small way to their efforts.

Therefore, the question should not be one of *"How are we going to attract younger people to the hobby"* but rather, *"Am I going to be one of those who will welcome newcomers to my club's activities and do my best to let them 'have a go'?"*

The only person who can answer that question is YOU!

David Proctor

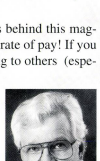
Join us in a great hobby!

If this is your first issue of *Australian Model Engineering*, welcome!

In successive issues we cover many topics centred on that wonderful process of model engineering — alias *tinkering*.

If you're new to model engineering as well as to our magazine, you'll benefit from getting together with other model engineers — we're good at sharing ideas and saving each other money! If you don't have any contacts, start by looking in Club Round-up to find a club that's near to you. Many of our readers have discovered people with similar interests literally just around the corner.

Helping other model engineers is the simple idea of the volunteers behind this magazine. Our readers write items for us — for the same (non-existent) rate of pay! If you have ideas, opinions or techniques that you feel would be interesting to others (especially from the newcomer's angle), please drop us a line. We can send you a useful guide and help with preparing artwork or editing.



I hope you'll enjoy the great fellowship that makes our hobby special, and that you'll support our advertisers — after all, they help pay our bills!

David Proctor
Managing Editor

HAFCO Workshop Equipment

BS4 METAL BANDSAW
- 115mm capacity • 240V
- 4-speed auto cut out
- Cast iron construction

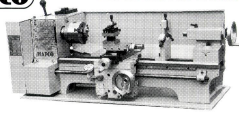
NEW!! 5" SWIVEL HEAD MODEL $499

$329

10 TONNE PRESS
(P141)
- Ideal for automotive, farm, light engineering and general workshop use
- 10 tonne hydraulic porta power can be used separately

$449

HAFCO AL50A BENCH LATHE



- 4" Centre height • 18" Between centres
- 240V, 6 speed, with 2 chucks, steadies splash guard & chip tray

$1195

HAFCO COMBINATION PANBRAKE/ GUILLOTINE & ROLLS

CAST IRON CONSTRUCTION

760mm x 1mm cap.
$795
1000mm x 1mm cap.
$1195

HAFCO BENDER BB-12

Weight 95kg

COLD BENDING: (steel)

Flat	70x6.30x12mm
Square	16x16mm
Round	18mm dia.
Angle	60x8mm

$449 (B043)

SANDBLAST CABINET
- 300 x 450 x 550mm steel cabinet
- Includes light, sandblasting gun with ceramic nozzle & gloves

$349

RF30 MILL DRILL
- Heavy Duty 2HP 240V TEFC motor
- Weight 300kg
- 3m spindle
- Chuck & vice supplied
- Table 730mm x 210mm
- Top quality finish

$1725

AL330 GEARED HEAD LATHE
- 6" Centre height 36" centres
- 9 Speed 240 volt
- Weight 380kg
- Accuracy guaranteed
- Exceptional value

PRICE INCLUDES:
2 chucks, faceplate, steadies, drill chuck, live centre, splashguard and stand

$3,195

*** ALL PRICES INCLUDE SALES TAX ***

FREE! 60 PAGE 1999 PRICED CATALOGUE OUT NOW! RING, WRITE OR FAX

NEW RELEASE

HAFCO DIGITAL INDICATORS

IDEAL FOR LATHES & MILL DRILLS

SPECIAL OFFER

• Accuracy 0.01mm • mm/inch switch
• auto cut-off (30 mins) • 3.6 volt battery

DIGITAL COUNTER $169 (D650)
Dimension: 105 x 60mm. 2m lead with magnet on rear panel

DIGITAL SCALES
200 m **$99** (D652) 800 mm **$319** (D658)
500 mm **$178** (D655) 1000 mm **$429** (D660)

*** DIGITAL READOUT TO SUIT MILL DRILLS**

$399
Includes 2 scales (200mm & 500mm) and 1 Counter

HARE & FORBES PTY LTD
Established 1930

NSW: 180 George Street, PARRAMATTA 2150 Fax: (02) 9891 2467 Ph: (02) 9633 4099
QLD: 550 Kessels Road, MACGREGOR 4109 Fax: (07) 3849 1414 Ph: (07) 3849 1888

SUPPLIERS OF NEW & USED MACHINERY AND WORKSHOP EQUIPMENT

ALL PRICES INCLUDE SALES TAX. MAIL ORDERS WELCOME.

ME799

Flying Solo

Story and photos by Terry Lane

All you aviation buffs can put on your best disappointed look now. Contrary to the title, this article is not about aeroplanes (or airplanes as our American cousins would have it), rather it is a revue of some of my workshop activity since leaving the club scene and 'going it alone'. This in response to a call by our worthy editor some time since, for word from the 'other side' of model engineering.

Not that I am anti-loco by any means, I have built two of them over the years and still follow the activities of the locomotive men with a great deal of interest. There are, however, other things in life and I found that I was happier taking a different path.

There is no doubt that our hobby offers something for everyone, the range and scale of activities is almost limitless and is restricted only by the workshop equipment available to us and to our financial resources (which more or less amount to the same thing). Defining my own interests is a little more difficult, stationary engines certainly, along with various machinery to give them something to do, but by no means limited to this. Quite apart from model engineering, I also shoot and fish, and spend a fair amount of time making sundry items for use in connection with these activities.

Recently I have been concentrating on expanding my range of workshop equipment as I probe new fields (I am currently working on a clock and, when I can put together a sufficient pile of the 'readies' will be building a Quorn tool and cutter grinder). Most of the projects covered here have been put together literally 'out of the scrap box' with little or no outlay on materials other than a few fasteners etc. This is not a reflection on the suppliers of 'our' materials', who I support when I can, but rather on the state of my wallet which, on the pension, rarely contains much more than a driver's licence, a couple of old supermarket dockets and someone's phone number, don't ask me who, there is no name written on the scrap of envelope, just the number.

All this does bring us to one very relevant point — you do not need wads of cash to engage in model engineering, just a lively imagination and a talent for picking up loads of old junk from which to sculpt your particular masterpiece.

One or two of the items covered might bear some closer

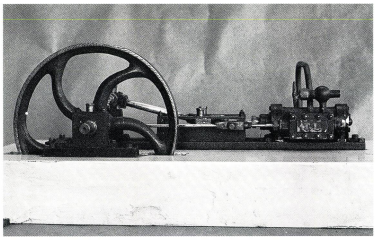


Photo 1

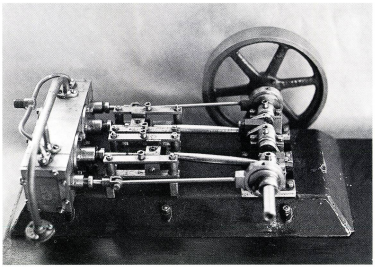


Photo 3

Photo 2

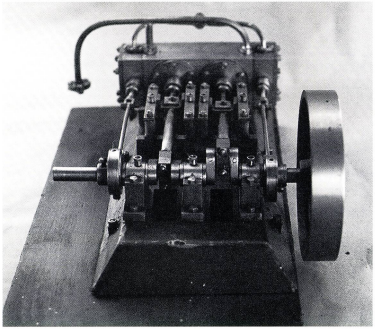


Photo 4

inspection and, with the consent of our worthy editor, we may expand on them in a future issue. Now on with the show.

- **Photo 1** — The author's version of *Alice*, a design featured in AME. This is a cross between the simple and advanced versions with a few personal touches thrown in for good measure. The flywheel is an old cast iron baby's stroller wheel that spent some 15 years under the bench before being pressed into service. The globe valve was made from a scrap of brass, using a wad punch as a form tool.
- **Photo 2** — There is no such thing as too many clamps. I recently spent a free afternoon supplementing my collection with these three. These things are so easy to make that there is no excuse for the model engineer to go short.
- **Photo 3** — Freelance twin horizontal engine was built with no drawings. The cylinder block for this engine was a piece of cast gunmetal originally destined to be *Simplex* axleboxes. When I made the axleboxes from cast iron this material became redundant, but I knew there would be a use for it.
- **Photo 4** — The delivery end of the engine. The bearing caps were made from strips of 1mm steel, shaped with a simple forming tool, the results were so good that I was loathe to drill and tap them for the oilers.
- **Photo 5** — This little rotary table caused quite a bit of head scratching during construction. Table is a slice from a 3" dia. cast iron bar. Base was gnawed out from a roughly flame cut piece of 20mm plate that I picked up from somewhere. The tee slots were cut with a home made cutter and are a first attempt at these slots. Gearing is via a 30-tooth wheel and worm with 12 graduations on the spindle collar giving 1° divisions. Detachable handles add to the compactness in operation.
- **Photo 6** — The rotary table in vertical orientation. A dedicated angle plate has yet to be made.
- **Photos 7** and **8** — Headstock fitted with dividing head. This was originally built for a simple change wheel/detent system and the dividing head made later. The body is made from a piece of 2" x 1" black flat bar, with the spindle at centre height for the Myford. A 60 tooth change wheel engages the spindle worm (ex car jack) and the home made division plate with its 60/55/45 holes gives a good range of divisions (not 7 though). I can supply a table if anyone is interested. The 3" chuck was bought many years ago and sees service on a number of devices in my workshop.
- **Photo 9** — By no means unique, this little tool punches holes, sets rivets, centre pops straight lines at pre set centres and is adaptable to other work of this nature using simple tooling. The body was hacked out of the same piece of material as the rotary table base, and stands 3" high. We might take a closer look at this one later.

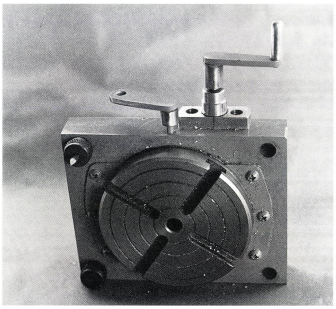


Photo 6

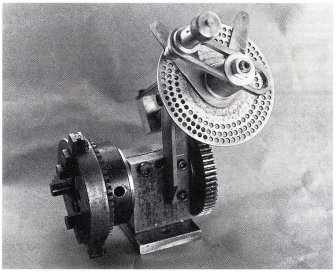


Photo 7

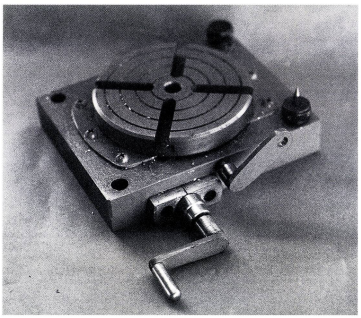


Photo 5

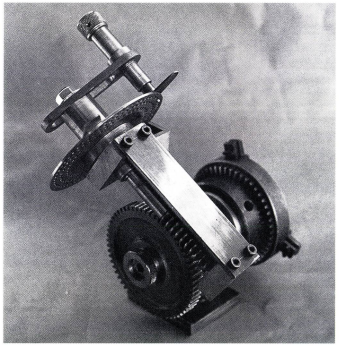


Photo 8

- **Photo 10** — Although by no means a replacement for a proper tool and cutter grinder, this grinding rest makes life much easier when you don't have one. The system uses a number of interchangeable tables, and with four linear and four rotary adjustments, can be set to accommodate almost any job in hand. The range of tables is being added to as the tool is still under development.
- **Photo 11** — The components of the grinding rest, things don't get much simpler than this.
- **Photo 12** — Give 'em something to do — model dynamo made from a piece of exhaust pipe with mild steel end plate. The casing houses a bicycle dynamo that generates enough power to 'light' the steam plant for night runs.

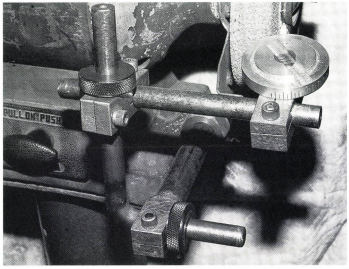


Photo 10

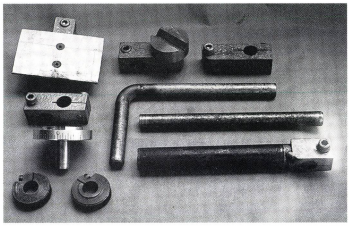


Photo 11

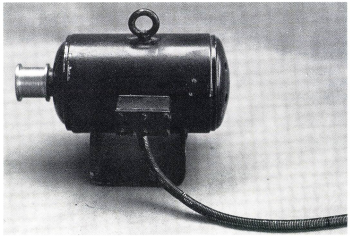


Photo 12

- **Photo 13** — Ageing eyes need all the help they can get. This bench magnifier was built from an article in another magazine and utilises the lens from a redundant slide viewer.

So there it is, a cross section of some of my recent doings and I hope you found it of interest. If nothing else, it shows what can be done for little outlay.

Producing articles is akin to spelling banana, the trick is knowing when to stop. When I first raised the subject of this article with our editor I thought that I might just scrape up enough material to do it, however, I find that I have more and to spare, and rather than try to cram it all in we will leave enough for a future issue.

Until next time??

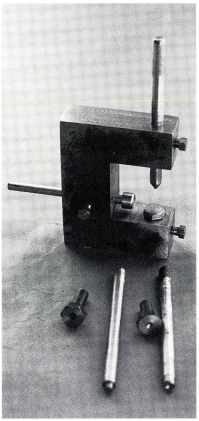


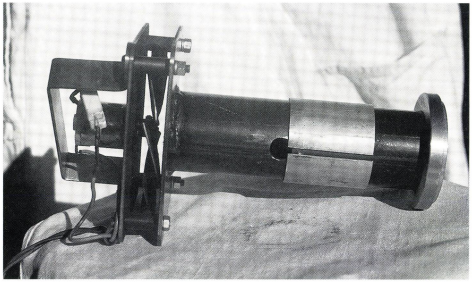
Photo 9

Photo 13

Blowers (or Suckers)

Story and photos by John Cummings

Drawing for publication by Rex Swensen



We call them blowers, but in reality, they are suckers because they suck air through the fire grate and tubes to help create combustion for our miniature fires in our locomotives, traction engines, etc.

This design, which I am presenting to our readers, is not my idea but a design given to me by Paul Stanley, a member of the Blue Mountains Railway Society.

When I first built this blower/sucker it was too severe — it sucked air and fire through the tubes instead of air only. To overcome this problem I drilled a 15mm hole (because this was the largest drill I had at the time) into the main pipe as shown. Then I took a piece of aluminium 1/16" thick x 30mm wide and rolled it to be a tight sliding fit on the main pipe, so that I could adjust the volume of suck that is needed.

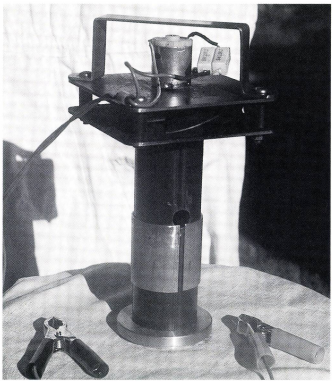
Over the years, I have come to realise that if you have a too severe sucker, most of the heat created goes up the chimney and it takes longer to bring the water to boiling point.

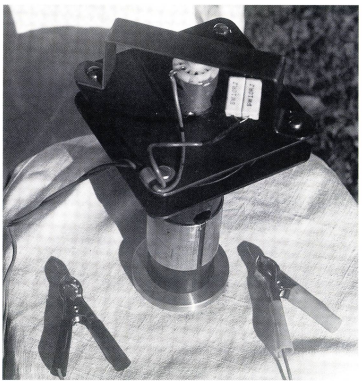
I started out looking for a suitable piece of pipe, which is how I came up with 48mm dia. OD (42mm dia. ID) x 150mm long. I turned a spigot on one end of the pipe to make it easier to locate while welding on the 2.5mm thick plate. On the other end of the pipe, I pressed a piece of brass which had been turned internally to suit the chimney on my 3½ class loco and externally to fit the Garratt chimney. I divided the fan into eight blades and cut along the line, ending at the two centre holes. I found that the tin snips gave just the right twist to the blades. I added a stainless steel handle to my blower to make it easier to lift off.

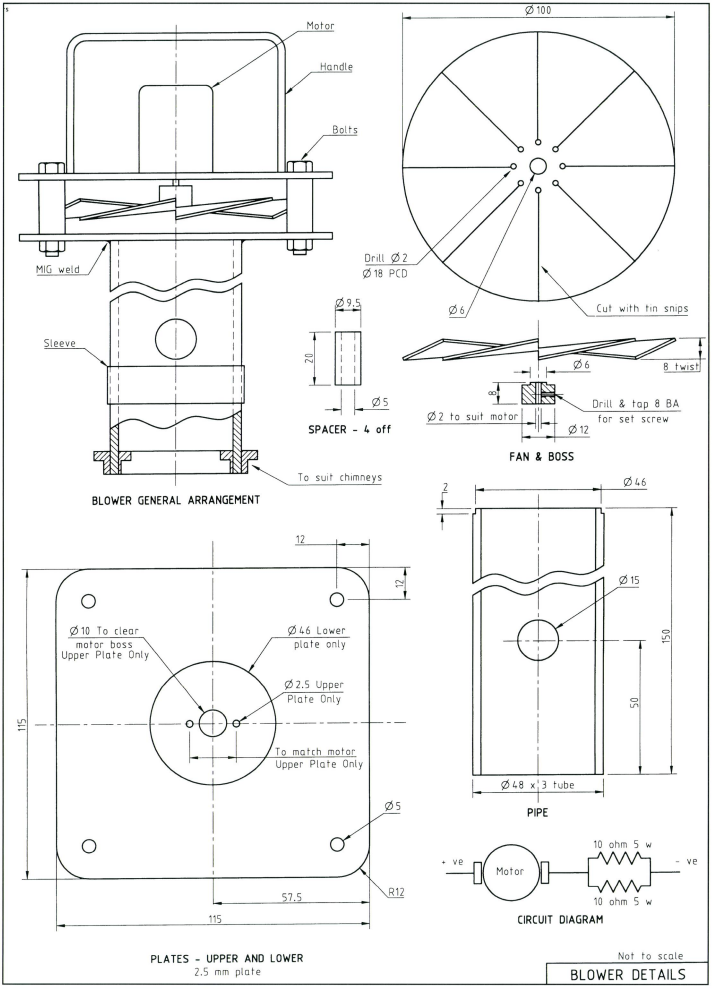
Materials needed

- 2 115 x 115 x 2.5mm mild steel plates
- 1 48mm dia. OD x 42mm dia. ID x 150mm long pipe (I have since thought that maybe exhaust pipe would do the job)
- 1 100mm dia. x 1mm thick brass for the fan
- 1 12mm dia. x 7mm long brass for the fan boss
- 4 9.5mm dia. x 20mm x 5mm dia. hole for spacers
- 4 M5 x 35 long screws and nuts to suit
- 1 12 volt motor (from Tandy)
- 2 alligator clips
- 1 length of electric cable from motor to clips
- 2 10 Ohm x 5 Watt resistors (in parallel)

Our editor has given it his stamp of approval after trying it out on his loco at the Wollongong Hot Pot weekend. *(The editor reckons he just might make one ... Ed.)*






Motor
Handle
Bolts
MIG weld
Sleeve
To suit chimneys
BLOWER GENERAL ARRANGEMENT
Ø 100
Drill Ø 2
Ø 18 PCD
Ø 6
Cut with tin snips
Ø 6
8 twist
8
Drill & tap 8 BA
for set screw
Ø 2 to suit motor
Ø 12
FAN & BOSS
Ø 9.5
20
Ø 5
SPACER - 4 off
2
Ø 46
Ø 15
150
50
Ø 48 x 3 tube
PIPE
12
12
Ø 10 To clear
motor boss
Upper Plate Only
Ø 46 Lower
plate only
Ø 2.5 Upper
Plate Only
To match motor
Upper Plate Only
115
Ø 5
R12
57.5
115
PLATES - UPPER AND LOWER
2.5 mm plate
+ ve
Motor
10 ohm 5 w
10 ohm 5 w
- ve
CIRCUIT DIAGRAM
Not to scale
BLOWER DETAILS

The Guayaquil & Quito Railway

Story and photos by Ross Bishop-Wear

The Guayaquil and Quito Railway in Ecuador was built between 1890 and 1908 with American money and I would imagine, performed a fundamental role in developing this mountainous and unpredictable country by providing an important transport link from Quito and Riobamba in the highlands to port of Guayaquil down on the coast. Further branch lines existed to Cuenca in the south and San Lorenzo on the coast to the north of Guayaquil.

Ecuador is an unusually difficult country to sustain infrastructure such as roads and railways due to the diverse geography and the annual cycle of torrential rain, floods, mudslides, earthquakes, volcanoes and whatever else comes along. Over the years El Nino, referring to the occurrence of exceptionally severe weather conditions brought on by warm ocean currents in the Pacific, has taken out bridges, washed out large sections of track and buried others under metres of mud, causing partial closure of the line for years at a time. It hardly seems possible that the motivation to reopen has been a financial one but time after time repairs have been carried out and the operations continue albeit a weekly *Mixto* or railcar every other day.

As many of the local passengers can't afford to pay the mere pittance of a fare, financially speaking, one must assume there is a large component of national pride in keeping the line active. In the last decade the majority of revenue has come from tourist charter during the dry months between July and September which has been sufficiently lucrative to warrant substantial annual repairs to be carried out. While such repairs are only of the barest minimum possible it has meant that interested people such as myself have been able to experience this extraordinary journey before the pressures of modern living filter into Ecuador and relegate the G & Q into history.

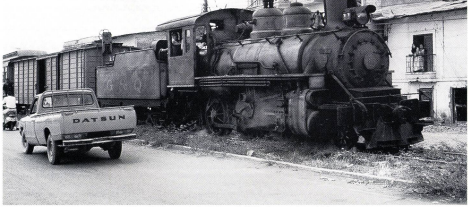
Extra # 53 — El Tren de los Andes

The route

The 3ft 6in gauge line departs Guayaquil from Duran, or more precisely Alfaro, which is a suburb named after President Eloy Alfaro who facilitated the construction of the railway at the beginning of this century. The station is across the bay from Guayaquil proper, accessible by ferry or via a long road bridge. There has been talk over the years of building a railway bridge across the water to the city centre but I feel this was always unlikely and nowadays a definite negative. The line sets out across the wet lowlands going east through the bananas and a number of depressing settlements in the first 80kms until you reach Bucay at the foot of the Andes. The going is fairly flat and easy work for the light-weight Baldwin Mogul from Duran. Bucay is a wet, muddy town of unattractive and dubious concrete structures and represents the beginning of the Andes Division of the railway. Here there is a sizeable loco depot, workshops and trackwork to facilitate hours of nightly shunting to make up suitable trains for the climb ahead. A much heavier Baldwin 2-8-0 takes over here to tackle the 80 odd kms of unrelenting 1 in 20 to 1 in 25 (uncompensated) that lies between Bucay and the summit at Palmira, 3000m above.

The summit at Palmira offers only brief respite as there is yet another summit at Cajabamba before descending into Riobamba at 2750m above sea level. This marks the end of this division and here, a large loco depot and workshops exists to cater for repairs of engines (steam and diesel), railcars and the construction of rolling stock as well. Resting at the base of Chimborazo, a snow capped volcano of 6310m, Riobamba is a bustling city marking the beginning of a journey through The Central Corridor of Ecuador, the Provinces of Chimborazo and Pichincha, a spectacular valley of rolling farmland bordered on each side by a total of 12 volcanoes of which 6 remain active today.

Between Riobamba and Ambato, 80kms away, lies the highest point on the railway. Urbina summit is 3600m above sea level (11,841ft) and 1 in 25 all the way. The city of Ambato is built around a deep river canyon and once departing Ambato station the line winds through the city for some time to descend to a point where the river can be crossed and then it's back to the 1 in 25s through the city on the other side. Above Ambato things level out and the line undulates along through several sizeable towns before making an assault



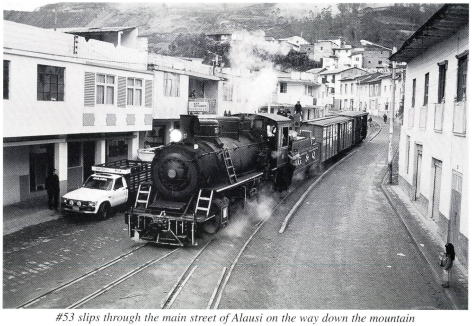
The light weight Mogul #11 departing Alfaro

on the final summit beneath a much revered volcano called Gotopaxi. Here there is a National Park, a NASA radio telescope installation and a substantial forestry industry. From this point it is basically down hill with the exception of a slight rise into Quito itself. A total distance of 460kms from sea level to 3600m up in the Andes at the highest point, the ruling grade being 1 in 17 uncompensated and hour after hour of 1 in 20 to 1 in 25, 2 tunnels, 1 zig zag and countless bridges along the way. The scenery is fantastic to say the least and the logistics of building a railway through such difficult terrain commands the highest respect as do the men that operate the trains in such trying conditions.

Breath taking scenery as we steam hard up the river

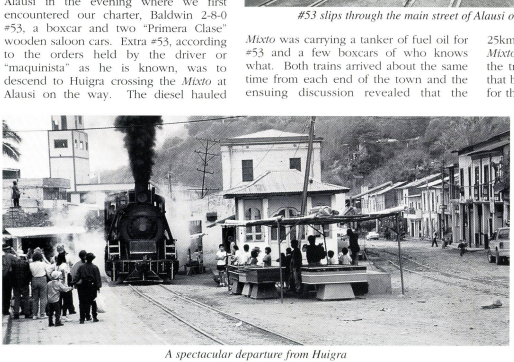
The journey begins

My journey took place in August of 1998 following an El Nino season which had devastated much of Ecuador and destroyed the lives and property of thousands of people. If this sounds serious, it was, but the people of Ecuador are accustomed to overcoming setbacks with an ease and manner that is an embarrassment to the so called civilised world. As soon as the rain had stopped and the flood waters receded, work commenced on reopening the railway. One month later all but the section between Guayaquil and Bucay was operational. In the lowlands amongst the bananas, a bridge had been seriously damaged by flood waters, and mudslides in the Chanchan River Canyon continued to bury the track on a daily basis. Rather than risk having a train become trapped in the canyon with no way out the other side, the Railway Company declined to allow our departure from Bucay, the journey commenced instead from Huigra about one third of the way up the mountain.



#53 slips through the main street of Alausi on the way down the mountain

We travelled by bus on shocking roads for a whole day to reach the town of Alausi in the evening where we first encountered our charter, Baldwin 2-8-0 #53, a boxcar and two "Primera Clase" wooden saloon cars. Extra #53, according to the orders held by the driver or "maquinista" as he is known, was to descend to Huigra crossing the *Mixto* at Alausi on the way. The diesel hauled *Mixto* was carrying a tanker of fuel oil for #53 and a few boxcars of who knows what. Both trains arrived about the same time from each end of the town and the ensuing discussion revealed that the 25kms up from Huigra had taken the *Mixto* 12 hours to cover having been off the track five times during that day! On that basis it looked like a long night ahead for the crew of #53 and I elected to sleep in a very comfortable converted railway office at Huigra and meet them in the morning.

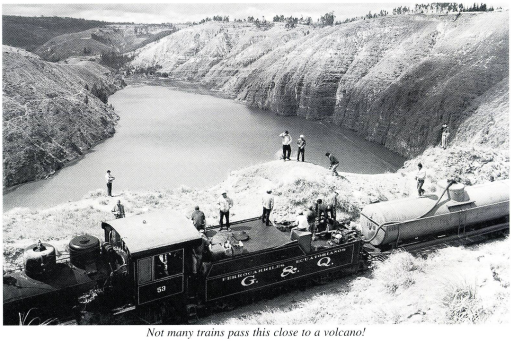


A spectacular departure from Huigra

It was a beautiful morning too. The little town of Huigra strung out along the river beneath towering green mountains on both sides, lit by patches of early morning sun high on the slopes. #53 was nowhere to be found. The despatcher at Riobamba confirmed that she had left Alausi at 9pm but no one had seen her since. Clearly they spent the night on the mountain most likely following a derailment in the dark. By 8.30 we knew no more so I started biking up the track to find them. Passengers from the train were hiking down looking very weary and disgruntled and

they reported the train was derailed again for the third time and as they were tired and hungry they had given up. After 7 or 8 kms walking, #53 appeared cautiously continuing the descent so I jumped on the footplate and the story of the nights events was revealed.

They got away from Alausi OK and descended the zig zag at Devil's Nose without a problem. Crossing the bridge at Chanchan the track hugs the river and this was where trouble struck. A washout left the track precariously clinging to the powdery earth above the river bed and in the dark, they had run onto a section where the 60 ton Baldwin had sunk into the mire. Eight hours were spent negotiating this 30m section of track which involved driving the loco along in the dirt, jacking it back on, hauling the train along the ground to a point passed the washout whereupon each carriage was re-railed as it came clear, eventually being ready to continue the journey. All this in the dark with a few oil flare lamps for light! A subsequent derailment not long after was not as serious but took another hour or so to rectify. Now twelve hours after leaving Alausi, 20kms had been won and Huigra and a hot breakfast were in sight.



Not many trains pass this close to a volcano!

Under way at last!

When I climbed into the cab that morning the crew were extremely tired as you can imagine. With nothing to eat, nothing to drink (river water will make you sick) and no sleep, they were in pretty bad shape. I fully expected them to quit that morning. On arrival in Huigra, to my absolute amazement the crew had a short break to eat and clean up, then set to and cleaned the engine till it shone, repaired a little end, replaced some brake shoes and pronounced their readiness to depart up the same way they had just come! I am constantly impressed by the patience and resourcefulness of the people in these countries. The crew accepted the task to take a train from Alausi to Huigra and back and it didn't matter what it took to do that — they would see it through. I liked these guys already!

A delightful feature of these little towns is that the track runs up the middle of the street. It's just part of the town. People drive on it, walk over it, hold markets in the middle of it and occasionally when a train comes along they just move out of way until it passes and resume their daily business. Many towns folk turned to watch #53 depart. Perhaps they were worried their houses would fall in because getting under way on the 1 in 20 really shook the very foundations of the town! We steamed hard up the river canyon towards Chanchan. The exhaust from the Baldwin and her stovepipe dominated everything. Flames from the oil fire pulsed from the firebox extending almost back to the tender. To cross the footplate, flames licked one's legs! Black smoke shot high into the air. To the right a vertical cliff towered upwards, to the left the river below. To be negotiating the wild Andes Mountains by means of such basic technology was truly an exhilarating experience.

Below Chanchan station was the washout that had presented all the problems during the night. We stopped short and the multi skilled crew set about relaying the track. In the daylight the severity of the situation became clear. The ends of the sleepers were practically hanging over the river bank. I wouldn't have been at all surprised see #53 fall into the river. We stood with our cameras ready as they eased over newly repaired track and to our relief, they made it. Not even a wheel off! These guys knew no fear. They did not need technology — they had courage, intelligence and teamwork. They could do anything!

The next few hours were more of the same with even more spectacular scenery around every curve. I did a spell of sanding with a paint tin on the front buffer beam which was pretty exciting. The exhaust was deafening and the searing heat from the smokebox door was burning my neck. The track was making all kinds of sounds of protest as #53 hammered along — I guess these are things you are better off not knowing when you are sitting back in the "Primera Clase" car! The worst of the track behind us we were making pretty good time, about 20 to 25 km/h at a guess, which when standing on a small step on the pilot is quite fast enough!

The railmotor or "Autoferro" to San Lorenzo

The Devil's Nose

Approaching Sibambe the river makes a sharp left turn and there in front of you is a huge rocky outcrop in the shape of a nose. If you didn't know better you would have to say this was the end of the line. For those in the know El Nariz del Diablo (The Devils Nose) is one of the highlights

of the journey. At Sibambe there is a junction and the now disused line to Cuenca heads south over a bridge and disappears into the hills. The Nose itself is negotiated by climbing a steep zig zag which clings to the cliff face and offers dizzying views from the footplate down to the river hundreds of feet below. Trains going in different directions are often passed in the dead ends of the zig zag at this point. We took water from the river by means of a petrol pump before heading up and this gave rise to the next set of problems.

Unfortunately, we also took on a lot of river gravel as well. This was revealed shortly when the injector packed up (only one was working anyway). Removing the cones revealed the gravel and clearing it was only a temporary solution. There was plenty more in the tender and plenty more injector cleans in store for the journey ahead. It was getting late in the afternoon and we had nearly 20kms behind us by now. Not much for a day, I know, but in terms of the progress of Extra #53 it was a significant achievement! Alausi lay less than 10kms of 1 in 20 distant. Our driver assessed the water situation and decided to make a run for it and to hell with the injectors. We scraped into Alausi in fading light narrowly avoiding another derailment from rocks on the track courtesy of the local boys and water barely visible in the gauge. Extra #53 returns after battling the Andes for 22hrs to win 50kms!

In the morning, it was clear our tireless crew had had a lovely night of packing glands, refuelling and cleaning the tender. At my inquiry they assured me the injectors were now "bueno" and that we would be in Riobamba by nightfall. The summits of Palmira and Cajabamba lay in between so it would not be any easier than the previous day. The departure from Alausi is a spectacular climb through the cobbled streets on a 1 in 17 which causes the very ground to tremble beneath your feet. The smoke and noise scarcely turns a head after all these years but never the less a few local people turned out to witness our departure with the usual smiles and waving. Once out of the houses, still climbing, the line crosses a high steel trestle, then winds it's way up the valley side. Giant mudslides were evident and a number of sections of track had been freshly excavated. It is hard for a Baldwin to tip toe up a 1 in 25 with 100 tons on the hook but our driver did an admirable job traversing this highly unstable area where the slightest wheel slip brought flurries of stones down the cutting wall. This was the only time the train crew showed any sign of being worried as they peered up at the cutting sides expecting any minute they would fall in on the train. One crew member clearly indicated to me that if this happened it would be the end of the journey. He was smiling optimistically at the time! We made it through though — nothing ventured nothing gained — and slogged on upward ever upward. The weather in the high mountains is ever changing from sun to rain to hail to wind and riding on the tender or the boxcar roof it was good to have a warm coat, embarrassed as I was to wear it when none of the crew seemed to have more than cotton shirts or a light jacket at best. More injector trouble followed for the same reasons as before and amongst the spares inventory in the Pandora's Box of a tender we found several other cones which we tried between cleanings, eventually resulting in both injectors being functional most of the time.

There were hours of heavy steaming ahead, exacerbated by the addition of a water tanker, and it was at this time a few passengers were allowed to have a drive. I took my turn which was a challenging spell of big wheel slips, bodgey trackwork and stunning river valleys. We stopped for a couple of blow ups along the way and all too soon the modern world came into view with traffic on the Pan American Highway and brightly dressed Indians tending their stock. A rather self opinionated bull challenged the Baldwin's right to pass but after a brief showdown with our cattle-handling train crew, relinquished his position and we passed on around the lake at Guamote, up over the rise and down into Riobamba.

Climbing the Devil's Nose Zig Zag

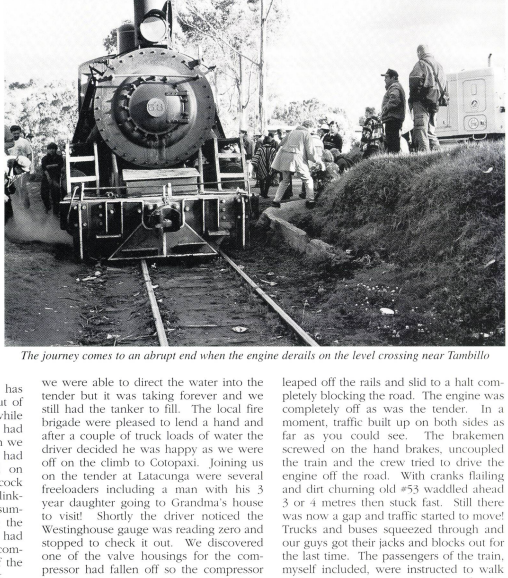
Riobamba

With many long descents on this railway (imagine heading down to Guayaquil) rather than grinding brake shoes all the way the technique is to run the engine in reverse with the cylinder cocks open and introduce water from the boiler to keep the cylinders cool. This is colloquially referred to as the waterbrake but this is rather a misnomer as more accurately the braking is effected by compression and the water is purely for cooling and lubrication of the pistons and cylinders. Its use results in the occasional shower of dirty water from the funnel to those sitting on the tender. Another unique technique used on the railway is the practice of watering the track to reduce drag and consequent flange wear on the tight curves. Again, water is taken from the boiler and dropped both ahead and behind the engine for this purpose. If the engine experiences traction difficulties the water can be turned off for the engine and left on for the following train. The water dries quickly and doesn't effect any following train, nor does this system require any maintenance of flange lubrication devices.

At Riobamba the engine was refuelled by means of lighting a fire under a bogie tank car placed on a high road and letting the thick fuel oil run down a make-shift chute into the tender. As insufficient oil was available, the tender was topped off with diesoline. This, I was told, was not as effective as the fuel oil but sometimes it was necessary to use it. Certainly departing Riobamba the fire was not as bright as yesterday and I wondered how much of this could be attributed to the thin air at this high altitude. I particularly noticed the

altitude as we left town because the track was blocked with logs and after jumping off the tender to help clear the way my heart was pounding and I was gasping for breathe! Beneath the watchful eye of Chimborazo we commenced our run along the Avenue of Volcanoes. It was the third day and we were still slugging our way upward. Urbina summit is the highest point and a great feeling of achievement is felt at this time. It seemed like we were almost there. Little did I know!

The descent to Ambato was tedious and uneventful save for a brief stop at Mocha where the crew tucked into a yummy serve of fried guinea pig or Cuy as it is called in Ecuador. The varmint is served complete with head and feet on top of a pile of rice looking like a sugar glider in full flight! Myself, I wasn't tempted settling for baked potatoes instead! As evening came we dropped into Ambato, a big sprawling city cut in half by a deep river canyon where the locals turned out in force to welcome the train.



The journey comes to an abrupt end when the engine derails on the level crossing near Tambillo

The descent to the river and the climb up the other side of Ambato has already been mentioned and once out of the city we undulated along for a while slowing to drop a track crew that had hitched a ride on the tender, and then we were on our own again. A bad blow had developed at the left cylinder and on checking we discovered a cylinder cock had fallen off! It was dangling by the linkage but the thread was damaged presumably having struck something along the way. Wouldn't you know it — we had another one in the tender! During a combined steam raiser/photo stop one of the fitters screwed it in and that fixed that.

Latacunga

Latacunga is quite a large town on the lower slopes of Cotopaxi. In striking contrast to the pleasant little towns we had passed through on the way up the mountain, Latacunga is particularly dirty with rubbish lying everywhere and none of the personal pride that I normally admired in these places. Drab concrete buildings sprawled on the edge of town serviced by dubious electrical connections. Riding on the tender or the boxcar roof you need to be ever vigilant for overhead wires and sure enough we struck one now. It zapped on the funnel then snaked along the cab landing on my crouching body and I thought that was the end. Of all the ways to go I was going to be electrocuted on the tender of a steamer in Ecuador! Who'd have thought? Anyway, the cable slid over me, zapped a few times on top of the oil tank and then it was gone. Whew, I'm still alive I thought! I looked at the driver who shrugged and kept on steaming.

The water standpipe in Latacunga was broken and was only a trickle in any case. By holding a rubber pipe over the outlet we were able to direct the water into the tender but it was taking forever and we still had the tanker to fill. The local fire brigade were pleased to lend a hand and after a couple of truck loads of water the driver decided he was happy as we were off on the climb to Cotopaxi. Joining us on the tender at Latacunga were several freeloaders including a man with his 3 year daughter going to Grandma's house to visit! Shortly the driver noticed the Westinghouse gauge was reading zero and stopped to check it out. We discovered one of the valve housings for the compressor had fallen off so the compressor would not pump any air. There was nothing else for it but to back up and hope we found the parts in the grass near the track. Fortunately, we did find all but the valve itself and to save the day (again) the crew made something up out of junk in the tender and a few coins and we were on our way.

On to Quito

As the Cotopaxi National Park came into view, a forestry operation became apparent and then there were trees across the track. We approached cautiously suspecting the possibility of banditos but this was not the case. An attempt to push to trees clear with the engine failed so a joint team of passengers and crew successfully heaved them off to one side. We stopped at Cotopaxi for a brake test (the compressor was still working) and now it was into reverse for the 60kms to Quito.

At Tambillo, about 25kms from Quito, the railway crosses the road to Esmeraldas down on the coast. This is a major thoroughfare with log trucks, buses and heavy traffic of all types. To smooth the crossing, the roads department (we assume) had filled it with gravel. We hit it at a fair clip, leaped off the rails and slid to a halt completely blocking the road. The engine was completely off as was the tender. In a moment, traffic built up on both sides as far as you could see. The brakemen screwed on the hand brakes, uncoupled the train and the crew tried to drive the engine off the road. With cranks flailing and dirt churning old #53 waddled ahead 3 or 4 metres then stuck fast. Still there was now a gap and traffic started to move! Trucks and buses squeezed through and our guys got their jacks and blocks out for the last time. The passengers of the train, myself included, were instructed to walk to the next town and catch a bus for the remainder of the journey. #53 sat in the middle of the road for the night before being rerailed the next day.

Epilogue

At the conclusion of our charter, I am led to believe, the employees were all terminated and the railway closed. Whether it remains closed will probably depend on many things from the change of government this year to the severity of the next wet season and the price charter companies are prepared to pay. The company I travelled with was not above spending money to reopen defunct rail systems in South America solely for railfan adventures. Obviously there are financial limitations in doing this. For the G & Q, there has been interest from American consortiums to purchase the line but for what reason I couldn't say. For many years the line has lingered on in one form or another and hopefully it will continue to do so if for no other reason than to treat railfans to the adventure of their lives!

Steam Chest

with Dave Harper

Hi there, steam fans, and welcome to a real mixed bag of steam and related goodies for this time around.

First up, following on a fair amount of interest in steam pumps, David Lloyd of Bucasia, Qld, sent me the photo of a small-ish Weir pump seen in the Mirani Museum. Details of the pump are: steam cylinder bore 6", pump bore 4", stroke 7". Capacity at max load is 810 GPH. The pump was built in 1948 and was used on Hayman Island, Qld, until about 1985.

David also kindly included some official Weir drawings of the pump, which I'm sure will be of interest to anyone contemplating building a model version. Thanks David! (**Photo 1** and **figure 1**)

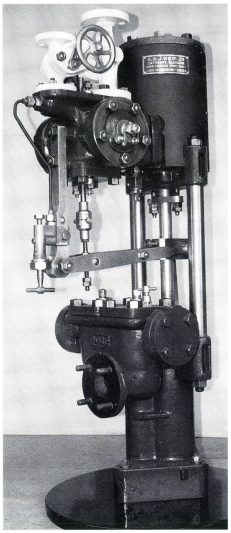


Photo 1

Air and steam

Another Queensland reader, Ted Lee, sent me details of some interesting engines he built, partly as experiments, and partly as working projects. To quote Ted:" These engines were built with a specific aim in mind, the first one to test the theory that the piston could work the inlet valve. **Photo 2** shows the engine running, using a 75mm chuck as a flywheel and a 100mm chuck as a base. It runs even better with the 100mm chuck as a flywheel. It has exhaust ports around the bottom of the cylinder above BDC. The inlet valve is an ordinary tyre valve with an air line attached, the piston opens the valve just before TDC and the explosion of air fills a combustion chamber which is about half the size of the piston stroke. The engine has a character all of its own (*I'll bet it has ... DH*) will run either way, and reminds me of early petrol engines!

The second engine was designed to look like a real engine with a fully enclosed sump etc. **Photo 3** shows it mounted on scale 3 x 2s and a concrete slab. **Photo 4**, the exploded view, shows, from L to R, the fuel tank and bracket, the head, air cleaner, tappet cover, oil dipstick, crankshaft and con-rod, 8mm spanner. Below that one crankcase half, cylinder barrel, piston and ring (nylon), various

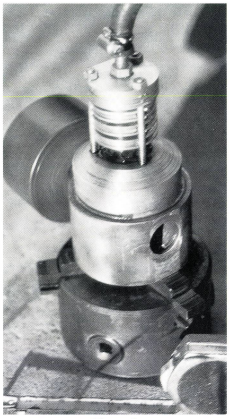


Photo 2

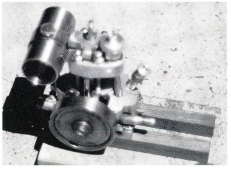


Photo 3

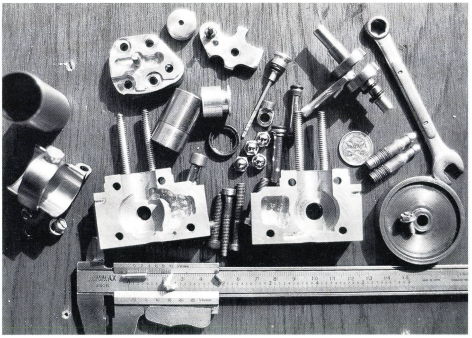


Photo 4

nuts and bolts, the other crankcase half, a 5 cent piece, the two valves, the flywheel, and on the calipers the two cam followers and a brass wing nut for the air cleaner"

Ted continues "I did have it running for several hours but it took 42psi to run at the beginning of the day, and 60psi by the end of the day. Then one cam follower jammed and went up the pipe to the head, so a rethink of the valving and sealing was called for". The rethink continues, apparently! The path of the experimenter is never easy, Ted!

The third engine was designed to do a heavy job, not to look good. It was designed to raise a heavy roller door, which it apparently does quite successfully. It is a three cylinder rotary engine, clearly seen in **photo 5**, but in **photo 6** where it is actually running, the slow shutter speed shows the cylinders whizzing round!

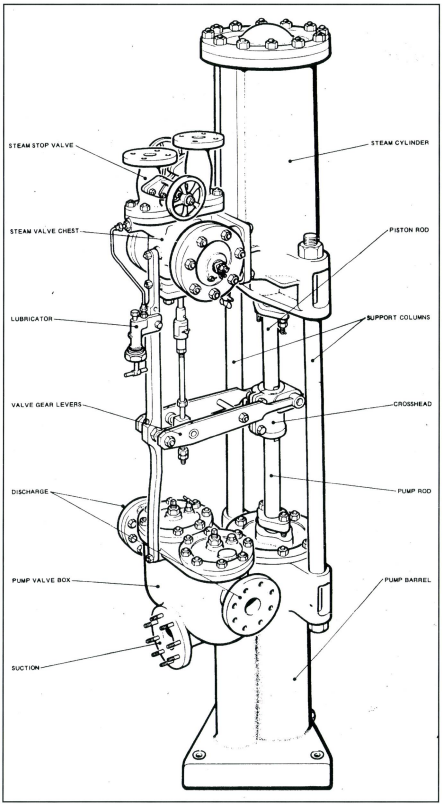


Figure 1

Having compressed air always on tap, Ted figured it easier to use it rather than an electric motor. I'm trying to find time to visit Ted and see all the other oddball engines he tells me he's built! Thanks for the pictures and the invite, Ted!

Steam in the air

Looking through my files, I discovered a number of articles relating to steam powered aeroplanes, both model and full-size. The only recorded, successful steam powered full-size aircraft was achieved by William Besler, owner of the Doble Steam Car Co. As steam cars were being put out of business by the petrol powered types, Besler desperately needed some publicity for his ailing car company. He designed and built a compound 90deg V-twin engine with flash steam boiler and automatic (oil) fuel and steam controls. Bores were 3" and $5^1/_4$", stroke was 3".

This unit was installed in a Travel Air 2000 biplane registered no X-4259. Its first flight, from Oakland Airport on April 12, 1933, was widely covered by the contemporary press. Details can be found in Jane's AWA for 1934.

Apparently, the most impressive things about the flight were the silence of the engine, which enabled the pilot to talk to people on the ground below, and the fact that the engine was reversible, which Besler, an experienced pilot, used to give

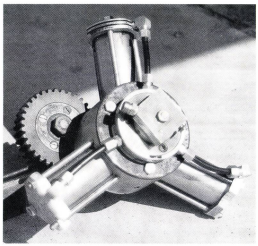


Photo 5

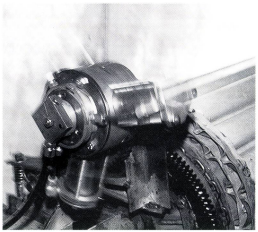


Photo 6

a very steep descent before landing. Limited water capacity ensured that the project would not be a commercial success, and the aircraft soon had its original engine restored. Besler's steam plant was last seen in the Boeing School of Aeronautics' engine shop in 1941.

In *The World Encyclopaedia of Aero Engines*, author Bill Gunston notes that Nathan C Price, a steam turbine engineer, flew a Travel Air biplane on 12 April 1933, powered by a steam turbine. The coincidence of date and aircraft type make this claim extremely suspect, and I'd be interested to hear of any other confirmation of this item.

As usual, my old friend Fred Lindsley was responsible for digging up these aeronautical oddities! Thanks Fred.

Models are more likely

Another good friend, Hugh Carseldine, loaned me an interesting old book a while ago called *Model Making*, by R F Yates, published by Norman W Henley of New York in 1929. The book has several chapters on steam powered model airplanes (it is a yankee book!) which I duly photocopied. They are: a steam plant for large model airplanes, a steam plant for small model airplanes, and a model steam turbine.

The large engine is said to deliver about 2.5hp using a flash steam boiler and a four cylinder radial engine. **Figure 3** shows the general view of the engine; the square crankcase is 3" square, which gives an idea of its overall size. The cylinders are 1" bore and $1\frac{1}{4}$" stroke. It doesn't say what size airplane is needed to carry it!

The 'small' engine is a 3-cylinder rotary type with bores of $\frac{5}{8}$" and $\frac{3}{4}$" stroke. It too has a flash steam boiler and also a gear driven boiler feed pump. **Figure 4**

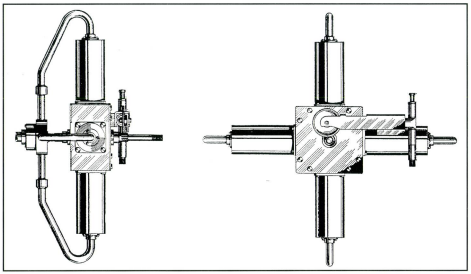


Figure 3

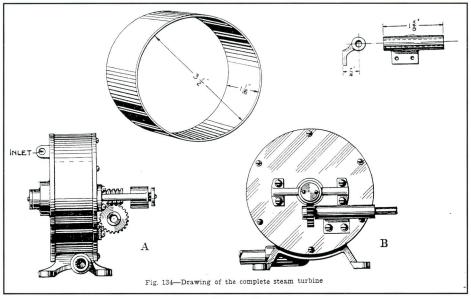


Fig. 134—Drawing of the complete steam turbine

Figure 5

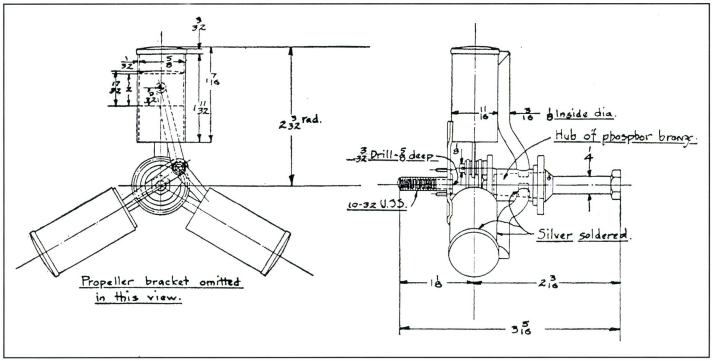


Figure 4

shows the general layout.

The steam turbine is also covered in detail, **figure 5** gives the diameter as $3^1/_2$". The three chapters run to about 40 pages, far too much to reproduce here, but, as usual, I'm prepared to provide copies for my usual fee of a book of stamps!

More steam winches

Back to earth again, and onto my current hobby-horse, steam winches. To give an idea of the variety of shapes these machines come in, I'm including a couple more photos from my file; **photo 7** is of the neat little anchor winch on the steam tug *Forceful*, pride and joy of the Queensland Maritime Museum.

It is a second order winch, the drive from the crankshaft being via the large gear under the cover to the right of the drum shaft in the picture. The anchor chain can be seen on its special cast drum in the centre of the shaft, which no doubt has a dog clutch and brake fitted. The outer drums are for general hauling, a rope being taken one or two turns around the drum, then pulling on the tail of the rope gives enough grip for the drum to haul in the rope. This principle is widely used on yacht winches for sail setting etc.

If all else fails, there is a shaft across the top fitted for manual winding!

Photo 8 is of a much larger, twin drum winch, one of many scattered around the yard of Graham Chapman's factory just north of Brisbane. It shows the twin disc cranks, gearing to the drum shaft, and the wide cast crosshead guides. This was taken as a general interest shot (note the steam hammer in the foreground) so I didn't note any details of the winch. These could be obtained if required.

Dave Sampson's latest

Dave Sampson turned up at the Boiler House a while ago with a new addition to his model collection. I took the opportunity to get him out in the sunshine with it for a quick photo shoot! **Photo 9** shows that it's a neat open column launch type engine made to Dave's usual high standards. That's his hand in the background, which gives an idea of the diminutive size of the model.

Photo 10 was taken with my macro lens and shows that even this close up, it's hard to fault Dave's workmanship!

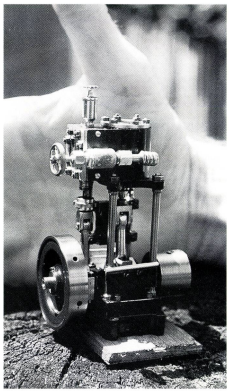


Photo 9

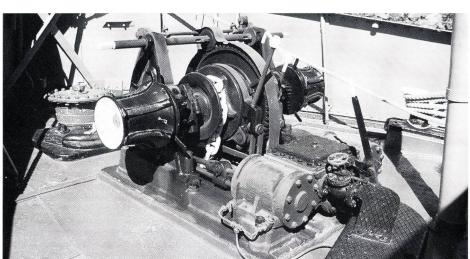


Photo 7

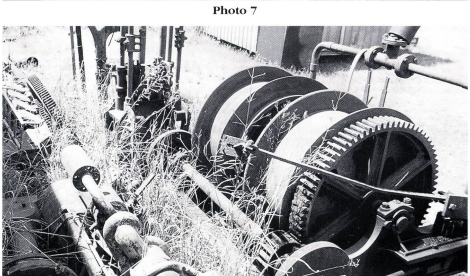


Photo 8

More from Maurie Turner

To finish on an equally high quality note, here are a couple more examples of Maurie Turner's work, as kindly supplied by John Lyas. **Photo 11** is Maurie's version of the classic *Unicorn* design by Edgar T Westbury of the English *Model Engineer*. This is the ultimate type of single cylinder horizontal engine used in countless factories around the world. The overhung cylinder allowed unrestricted expansion of the cylinder without stress, and the general layout carried over to most of the early petrol and gas engines well into this century. The flywheel is $4^1/_2$" dia.

Less conventional is the engine in **photo 12**, a miniaturised version of the early table engines. This is known as a trapezium connecting rod engine, for fairly obvious reasons. The flywheel on this model is 8" diameter.

These types generally disappeared when it was realised that inverting the cylinder and connecting the piston directly to the crank via the crosshead made life much simpler all round. The only possible advantage of this layout could be a lower centre of gravity in a launch engine. This style of connecting rod lives on, rather modified, in 'Banjo' pumps.

Blast from the past

Thanks to one of our readers, I recently acquired a priceless volume of engineering history; it is a bound volume of *The Engineer* magazine, covering the first six months of the year 1867. This A3 format volume is about $1^1/_2$ inches thick, and in among the hundreds of pages of tiny print are many fabulous engravings of all kinds of steam engines. These mostly refer to items displayed in the Great Paris

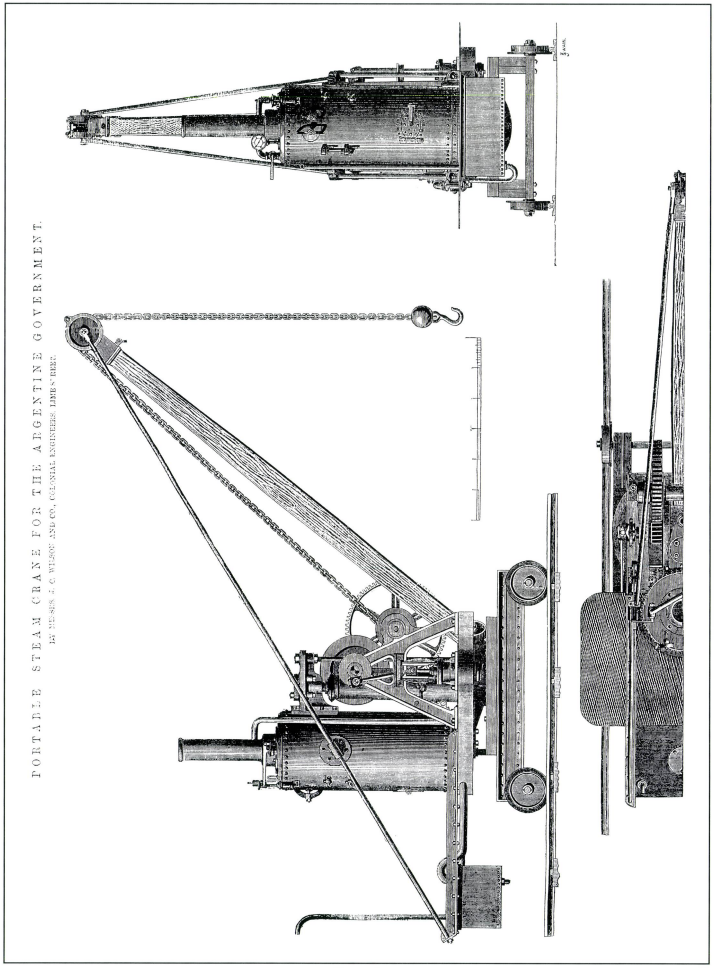

PORTABLE STEAM CRANE FOR THE ARGENTINE GOVERNMENT
MESSRS. J. C. WIGHT, ASSOC. COLONIAL ENGINEERS, LIMES STREET

Figure 6

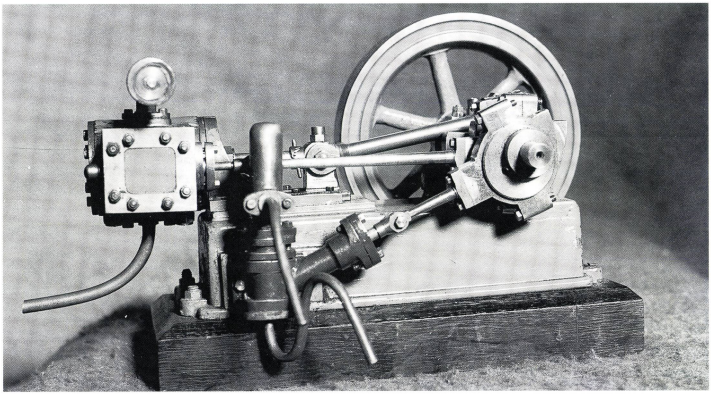


Photo 11

Exhibition of 1867, and is probably the reason this particular volume has survived so long.

As is to be expected, the book is getting pretty fragile, but I managed to photocopy nearly 40 of the engravings, sets of which have been selling briskly among my friends for $5 per set! Mailing this many A3 sheets could get expensive, and would best be done in a tube, but if anyone is interested, I'll look into the cost.

As an example, I'm including a *Portable Steam Crane for the Argentine Government* (**Figure 6**). This is one of a number of steam cranes in the set. There are also several steam winches, which were apparently the latest you beaut thing at that time, plus steam hammers, marine and stationary engines, etc etc. Reducing them is mostly not an option, as the printing is so fine it would become illegible. However, they are a unique historical record of the time, and I'm very grateful to Ted Lee for helping me obtain this valuable book. Incidentally, doing an internet search to see if any similar volumes were available, I discovered that a book dealer in Sydney (I think) has several volumes dated in the 1880s, priced at $250 each....I didn't pay that much!

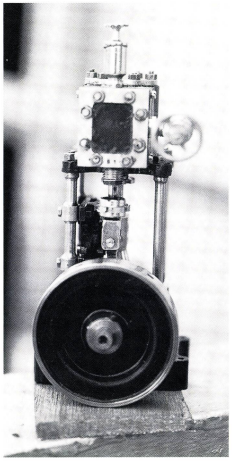


Photo 10

Files on file

Finally, I have eventually got around to listing all the miscellaneous files I've gathered over the last five years or so, mostly copies of papers from the Transactions of the Newcomen Society and the Proceedings from the Institute of Mechanical Engineers. These cover a motley collection of subjects like horse drawn carriage springs, fulling mills, biographies of early engineers and Newcomen engines.

The list runs to two and a half pages, so is a bit long to include in this column, but I could supply a copy to anyone sufficiently interested.

That really is all for this time. Till next time, happy steaming!

You can email Dave at:
sandave@bytesite.com.au

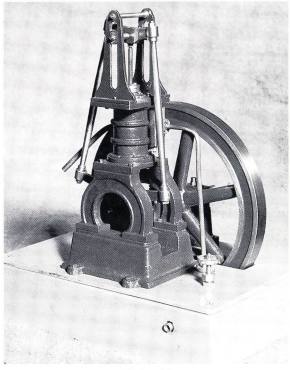


Photo 12

Split Spoke Wheels in 5" Gauge

by Bruce Allen

Photos by David Proctor

A project that has kept me going for a few years has been the making a rake of non-air coal hopper wagons as seen for many years in the Newcastle region of NSW. Some of the wheels that I used were spoked castings, while another wagon has solid disc wheels.

Looking at photographs of non-air hoppers most appear to have had wheels with split spokes. I can honestly say that up until now I have not seen any of these modeled in five inch gauge. The narrow space between the split in the casting would make casting difficult, so fabricating was the answer.

The rims were ordered by phone from Hawley's of Hurstville, profile cut from 16mm plate. They were 90mm outside diameter and 70mm inside diameter and were completely turned to a good finish on the lathe.

Subsequently, a cheaper source of material was found at a local engineering metal supplier. They stocked a very heavy walled pipe with similar dimensions.

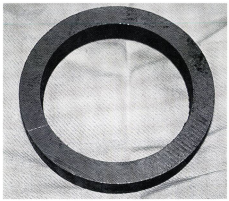
The spokes were made from 12mm wide mild steel strips 50mm long. These were bent to about 45 degrees as seen in the photograph. The hub was cut a little over length from a piece of 20mm diameter mild steel bar.

To assemble them I laid out on a piece of plate, a complete drawing of the wheel — rim, spokes, hub, the lot. After the second wheel was assembled the lines were nearly obliterated, but I found however, that if the spokes were of accurate size, the whole kit and caboodle almost centered itself anyway. Any small irregularity could be adjusted by eye. Even if it was a little off there is no mechanical problem as the axle hole was drilled after the assembly was brazed up, and besides, it would be a high grade rivet counter who could pick the error as it is right under the wagon and behind the W irons.

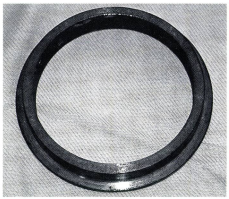
The parts were assembled horizontally, as stated, and tack brazed working from side to side to minimise distortion. I used the Comcoat Blue rods 2.5mm diameter. To make brazing easier I stuck a small piece of 6mm diameter rod horizontally in the vice to use as a hanger. The wheel was suspended in the vertical plane and the horizontal spokes were brazed in. The wheel was rotated one spoke at a time. In this way all the welding was done in the 3 o'clock and 9 o'clock positions. Downhand brazing is so much easier.

When cool, the wheel was returned to the lathe and the hub faced front and back. The hole for the axle was then drilled.

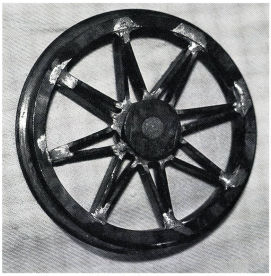
This is a small detail but it is the accumulation of these small details, which change a model from the ordinary to the realms of excellence.



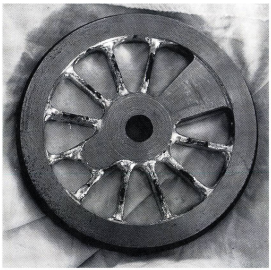
The heavy walled pipe prior to turning ...



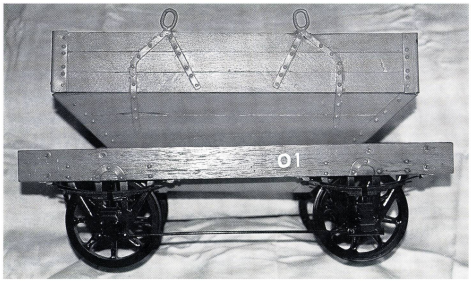
and again after it has been turned



The assembled wheel prior to machining



The same method can be used for other wheel types



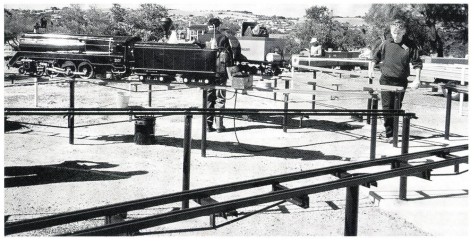
One of the nan-air coal hoppers complete with fabricated wheels

Point Richards Miniature Railway

(Rotary Children's Park — Portarlington, Victoria)

Story and photos by Murdoch Finlay

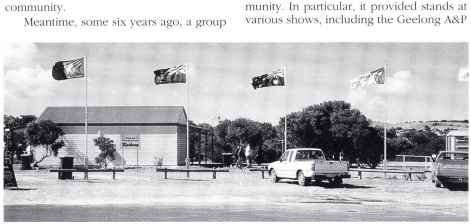
In the 1870's, the powers that be of that time decided to build a railway between Geelong and Queenscliff. After much discussion, it was agreed that the railway would NOT go through Portarlington. And so, for all these years, the Port folk have never had the pleasure of hearing the clatter of railway carriages on rails, nor the exhilarating sound of the whistle of a steam engine. But while the Port has missed out on these, and perhaps many other things over the years, it will not miss out for much longer. For whilst the old Geelong to Queenscliff Railway has long gone, the residents of Portarlington are about to get their very own Miniature Railway, complete with the running of steam trains and many other features. But before we tell you more of this venture, let us tell you a little history.



Part of the steaming bay area, with Chris Hibble's 3801 on one of the bays. Chris is actually in the act of moving the turntable to line up with his bay.

For many years the Rotary Club of Drysdale has been running an annual Art Show to raise funds in order that they could provide necessary works and facilities to the community. After these many years, it was considered by a number of members of the Club that a change was necessary, and so action began to try and find a new method of raising moneys which would ultimately be returned to the community.

Meantime, some six years ago, a group of about 20 people interested in Model Engineering decided to form a Club in the belief that such a club would help them to further their achievements, and to provide a forum for the exchange of ideas. After some initial teething problems, the Club (by now known as the Geelong Society of Model and Experimental Engineers or GSMEE for short) became incorporated, and began to establish itself in the community. In particular, it provided stands at various shows, including the Geelong A&P (Agricultural & Pastoral) Show, and the Geelong Vintage Machinery Show. Although not all the members of the Club are interested in steam driven railway locomotives, there is a small but growing number who are. And this group expressed an interest in obtaining/building/establishing a miniature railway on which they could operate their locomotives.



The station building from the carpark. The VR 'B' van (extreme right) is for general storage

Chris Hibble in full flight on 3801

For many years now, the Portarlington Foreshore Committee has been looking after the foreshore, operating the caravan park, and generally keeping a watchful eye on all the beach-side happenings. In earlier days, they had planned to see the caravan park extend further along the beachfront to ultimately reach Point Richards in the West. However, times have changed, and the area to the south and west of the Yacht Club has remained an unsightly reed filled swamp. The Committee felt that some use should be made of this area, but nothing had presented itself.

We now come to one of those magic moments in time when everything is favourable for the birth of a new project. The Rotary Club was looking for a fund-raising scheme, the Geelong SMEE was looking for somewhere to run its locomotives, and the Portarlington Foreshore Committee was wanting to do something positive with the Point Richards land. The Rotary Club contacted a model railroad club (now defunct), which directed them to the Geelong SMEE. The latter had commenced negotiations with the Geelong City Council for a site, but nothing positive had occurred. The Rotary Club took up these negotiations, and after a look at land in Drysdale (which resulted in objections by some of the local people), the Portarlington Foreshore Committee came

to hear of the search for a site, and put forward the Point Richards land.

After several joint meetings, the three organisations agreed to establish a miniature railway at Point Richards. And so the work began.

A small committee of Rotary Club members suddenly found themselves on a steep learning curve, travelling around the State looking at various miniature railway layouts, and finding out many of the myriad of things that need to be done in order to establish such a layout.

In addition :-

* The Foreshore Committee set about the task of obtaining proper lease of the land for use by the Geelong SMEE and the Drysdale Rotary Club as a Children's Play Park..
* The Geelong SMEE began the task of designing carriages (and later a locomotive) to be built for use on the new railway.
* The Rotary Club gathered a team to assist in building the carriages, and this team has carried on into the phase of building the railway track.
* The expertise of the Geelong SMEE is being put to good use. A special sawbench was constructed to cut slots in the sleepers (which hold the rails at the correct spacing). Jigs for the manufacture of points (turnouts) were constructed.
* The Foreshore Committee has had part of the old reedy lake cleaned out, and has assisted with the preparation of the road-bed for the railway.
* Approximately 700metres of track, eight sets of point, a turntable and six steaming bays have been constructed.

General view of the station area. The loco on the left belongs to the Rotary Club, built by Graeme Hallet, a founding member of GSMEE, who is driving it .The 5" loco on the centre road is a GWR 2-6-0 Pannier tank belonging to John Ramm, a visitor. The SAR 700 class on the right is petrol powered (Holden 6-cyl 179 motor), visiting from Diamond Valley Railway.

* A petrol powered diesel outline locomotive has been designed and built for the Rotary Club.
* A station building has been erected, many trees and shrubs planted, and six flag poles set up.

Many other things, too numerous to mention, have been done, or are in the process of being carried out. And many people and organisations have contributed in some way or another - some in a small way, some in a large way.

The culmination of all this work occurred on Sunday 14th March 1999, when the track was officially opened by the local member of Parliament, before a crowd of some hundreds of people. After the mandatory run of the official train, the track was opened to the public, and over 400 rides were given to paying customers. There were six locomotives running - three visitors and three locals. Three were petrol engine powered diesel outline, and three were steam.

Visitors are welcome on the usual running day, the second Sunday of each month. Running will be more frequent during the summer periods.

Additional information can be obtained from the Secretary of the Geelong SMEE by writing to

PO Box 442 Geelong 3220
or e-mail to:**darlea@pipeline.com.au**
or fax : (03) 5278 1528.

Vale Jack Stanbridge

John Stanbridge, always known as Jack, was born in Perth WA. His parents discovered at an early age that the best way to pacify him was to go to the nearest station where he would sit transfixed as the steam trains rumbled by. Thus was born his love of trains which would last a lifetime. After the usual schooling, Jack served his time as a pastrycook, then attended Tech to learn automotive schools.

At the onset of the Second World War, Jack enlisted in the RAAF and was trained on Tiger Moths as a pilot. However, due to a temporary surplus of aircrew he was posted as a Link Trainer Instructor. It was during the war that he met and married Patsy, his wife of 57 years and from this union came their two daughters, Valerie and Elaine.

After the war came several business ventures in trailer and caravan building and panel beating. In 1948 he realised it was time for Perth to have a dedicated shop, catering to hobbyists. Stanbridge's Hobby Shop proved him to be right and still proudly trades under his name.

It was in the early 60's that he became aware of moves by Keith Watson, Reg Barltrop. Bob Moss, Ken Foster and Kevan Perry to construct a miniature railway at Castledare. To quote Keith Watson: "One day Jack arrived on the scene, and when I asked him to get a shovel and help, he replied "I am not a shovel man!" However, one week later he arrived at the track with a front-end loader and announced "Get out of the way". When asked who was paying for the loader, he replied "It is not your worry, but it is better than a shovel!" Jack became the prime moving force and every week would arrive with 20ft of track or a turnout on top of his roof rack, while the original crew stood amazed at his efforts.

Bricklaying followed as the clubhouse and surrounds rose into an outstanding monument to those farsighted few who did the hard work and constructed the magnificent Miniature Railway, in the most enviable setting we see today.

When rolling over the large trestle bridge named Stanbridge, spare a thought for the man who built it and whose name it bears. It cannot be calculated how many thousand dollars he privately donated to Castledare in the form of track and machinery, time and effort, mostly unrecorded and unsung.

In latter years, although a Life Member, Jack was not seen at the track very often, the years slowly taking their toll. He spent much time at work on his large HO layout, which was not surprising, as Jack loved all types and sizes of railways. He also wrote two books on Perth's early rail history as well as writing articles and comment for various rail related magazines.

He was an accomplished photographer — still, movie and video, a musician of note, an expert with welding and cutting torches, panelbeater, builder and adept at a multitude of other skills.

Sadly, Jack is no longer with us, the miniature railway hobby has lost a quiet achiever, a man whose detailed knowledge of Perth's transport system and trains in general has no equals.

Those of us who have shared his life and friendship are poorer for his passing.

— Rob Browne and Barry Glover

The 43rd A.A.L.S. Convention

Lake Macquarie Live Steam Locomotive Society — Edgeworth

by David Proctor

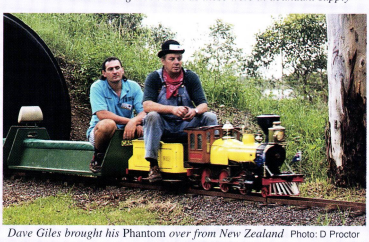
Darin O'Brien, these days from Melbourne, emerges from the tunnel behind his 5" gauge Bundaberg Fowler Photo: David Proctor

John Hagen's "Newcastle Flyer" comprises 3806 and a set of eight scale ride-in passenger cars. Photo: Peter Polson

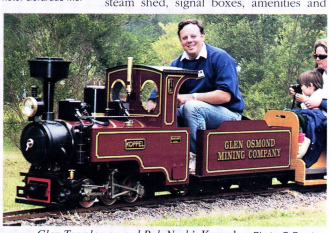
Scale rolling stock such as these were in abundant supply Photo: Gerardus Mol

Well, one thing that must be said for the members of the Lake Macquarie Live Steam Locomotive Society is that they are consistent with the weather when it comes to conventions. The 1999 Convention was unfortunately, very similar to the last one at Edgeworth in that it rained just about all weekend, but in spite of that everyone (except perhaps John Wakefield) had a good time and enjoyed themselves.

For those who don't know, the LMLSL grounds are located at Edgeworth, a small suburb in the city of Lake Macquarie, which is part of the greater Newcastle area on the central coast of New South Wales. The site can best be described as 6 acres of tree studded parkland with clubhouse, steam shed, signal boxes, amenities and



Dave Giles brought his Phantom *over from New Zealand* Photo: D Proctor

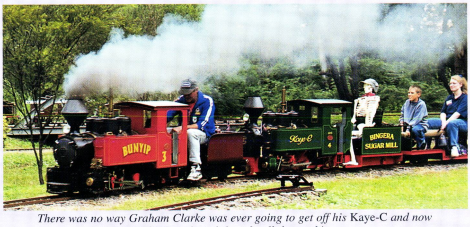


Glen Templeman and Bob Nash's Koppel Photo: D Proctor

approximately 3 kilometres of track catering to 3½", 5" and 7¼" gauges. This was the first time I had been to Edgeworth and I must say I was most impressed with the track layout and the facilities. There is a large ground level 5" gauge track and a separate circuit of over a kilometre of 7¼" track. Although they are two separate tracks, there are places where they converge and cross over on the level and there is some parallel running. In addition is a long elevated track for 3½" and 5" and the smaller gauges are served by a new electric forklift type unloader.

Thursday

I arrived on the Thursday afternoon after a relaxing trip by Explorer train from Canberra to Sydney and a mundane trip on an interurban electric to Cardiff. John Cummings met me at Cardiff station and mentioned that things were a bit wet. On arrival at the track I was greeted by the sight of a pair of gumboots nailed high up a pole by the entrance with a FOR HIRE sign under them and inside the grounds, lots of raincoats and umbrellas. Hardly a loco in site, but boy, was there a great collection of tarpaulins in the steaming bays and sidings. There were a few locos on the track, one of which was Dave Giles' 7¼" Phantom from Auckland NZ. This loco was on the go all weekend, which I guess is not surprising when you consider



There was no way Graham Clarke was ever going to get off his Kaye-C *and now Ian Smith's* Bunyip *is left to do all the work!*
Photo: David Proctor

the cost of bringing it over. There were many early arrivals and opportunities to meet up with those not seen since the last convention. Thursday evening was the first lineup for the weekend in the big tent for a meal, and the meals weren't bad at all!

Friday

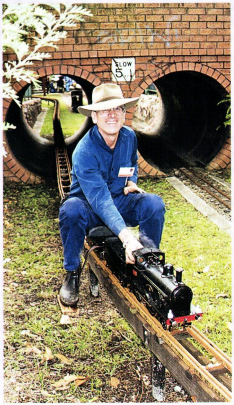
The first sound to greet the ears on Friday morning on waking was the gentle rhythm of rain steadily beating on the roof. There were a

G Mol

D Proctor

P Polson

Clockwise from left: A Locomobile steam car was something different. Jess Jestico pulls out from the station on Max Faulkner's BB18¼, Hugh Elsol on the elevated with 3½" Hardwick *and John A'Beckett with 3830.*



D Proctor

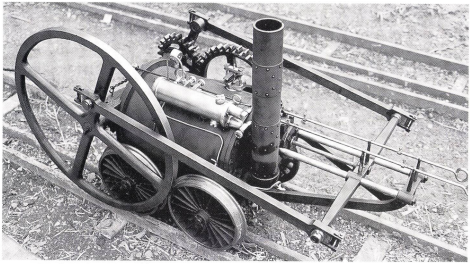
few more locos venturing onto the track, but most of them were still hiding under tarpaulins. I was starting to think that this report would be illustrated with photos of various coloured tarps and a note to say what was under them. More people were arriving throughout the morning and once again there was plenty of time to catch up on what has been happening over the last year. Having lived in Queensland for several years and New Zealand for many years before that, I was pleased to be able to see some old friends from the right side of the border (sorry NSW) and to catch up with some Kiwis I had not seen for over twenty years.

Dave Giles, Murray Lane, Mike Orange, Jim McLean, John Sharman and Roger Reynolds were over from New Zealand for the convention, and Dave, as has been mentioned, brought his 7¼" gauge *Phantom* with him. Murray is building a Gnome Monosoupape 18-cylinder aero engine, which he also brought over and put on display in the Steam Shed. It is a beautiful piece of work and I would hope that some day I will have the opportunity to see it completed and running.

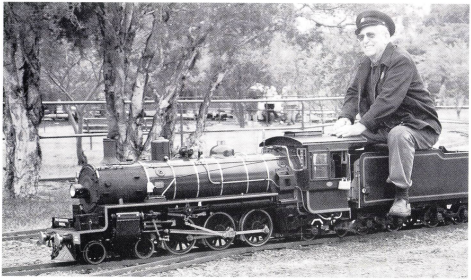
Scott Robertson really gets down to it behind his Baldwin U105 on the 5" track Photo: D Proctor

When Dave offered me a drive of his *Phantom* I was not going to say no, particularly as there is an article about it coming up in AME shortly. I took it for a few enjoyable laps of the track and must say this loco would have to be one of the easiest and most comfortable locos I have ever driven. I reckon I could have sat there all weekend, except that this report would have been a bit unbalanced. I am not going into any details about the *Phantom* here so that will give you something to look forward to in the next issue.

As the day progressed there was steady activity on all three track circuits, many simply choosing to ignore the weather and why not? The full size trains did not stop



Mark Watkins' fine 7¼" model of Trevithick's Penydarren locomotive Photo: D Proctor



Bolton Trophy winner, Max Faulkner and his Queensland BB18¼ Photo: Gerardus Mol

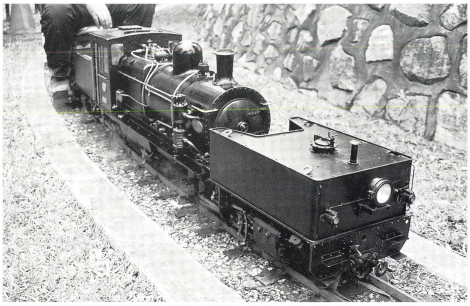
Some of the action in the 5" yard Photo: DP

just because it rained! AME Retail, E & J Winter and the Beals from South Australia had trade tents set up near the clubhouse and the NSW Rail Transport Museum had their sales tent set up alongside one selling tools near the 7¼" steaming bays.

Friday night was the annual AMBSC meeting with a motion passed aimed at freeing up boiler inspector requirements and then quite a bit of discussion on circulatory devices in boilers.

Saturday

The day of the Official Opening dawned with the skies a bit clearer, but still overcast. The rain tended to hold back with just the occasional little drizzle. John Wakefield shortened his convention visit by falling and badly breaking his arm. (Was he sober, you ask? All I can say is it was 9:00am!). The outcome was that he was admitted to hospital, where he underwent surgery and spent the remainder of the weekend. This was an extra disappointment for John as he was planning to continue to North Queensland after the convention to the annual run at Roger Anderson's place at Pinnacle Village. (Actually, he did say afterwards, that if he had not been sober, his arm probably would have suffered less damage).

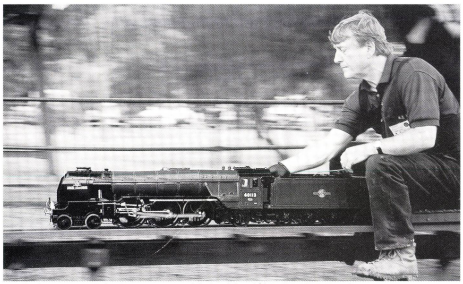


Keith Bradford's 5" Aust. Portland Cement Garratt attracted a lot of interest over the weekend and further details and photos can be seen in Garratt Gossip on page 47 Photo: D Proctor

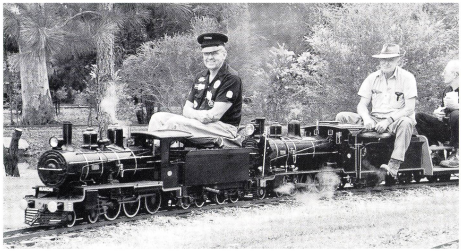
Over by the Steam Shed, Mark Watkins was getting his gas-fired 7¼" model of Trevithick's *Penydarren* locomotive ready for a run. In this gauge it is still a very small model, and Mark's version really looks the part. Inside the Steam Shed, on the display table were Murray Lane's aero engine, John Lever's vertical steam engine and the entries for the AME Under 25 Encouragement Award (see page 33).

Besides playing trains, there were other activities throughout the weekend. The ladies were running craft demonstrations and a craft stall, there was a coach trip to Morpeth and the Hunter Valley Vintage Farm Machinery Club staged a display.

The Official proceedings began with engines lining up just after 1:30pm for the Official Opening and Grand Parade. The parade began with the official train leaving



Railway artist John Brown at speed behind his 3½" GNR/BR Pacific Photo: Peter Polson

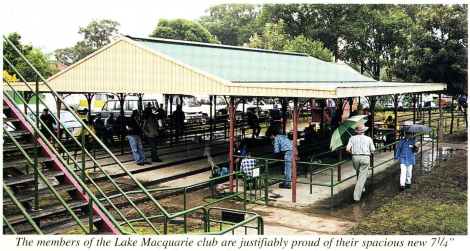


Messrs Dannenberg (PB15) and Williams (C16) showing that Queensland style Photo: D P

Peter Manning (left) presents the Southern Federation award to Bill Belton while Barry Glover (right) looks on. Photo: D Proctor

the 5" gauge Clarence station, running around the 5" circuit and thence to the new station where the official party changed to the 7¼" gauge for a run through the bush. With this part of the day had finished and it was about 4:00pm, the rains really came again, but all three tracks were getting a lot of use now and the rain was largely being ignored. Ross Edmondson was to be seen trundling around on the 5" with an impressive scale length goods train in tow behind a NSW 36 class, while Hugh Elsol literally flew past on the elevated behind his 3½" LNWR *Hardwick*. Hugh has never been accused of holding people up! There was a sad time on the 7¼" when it was discovered that Graham Clarke, who could not be prised from the driving seat of his Kaye-C even for food, had wasted away to a skeleton! The photo describes this tragedy more aptly than words can!

Saturday evening was the time for the AALS Annual General Meeting. The executive position vacant this year was that of Secretary and Peter Manning was re-elected unopposed. As most of the voting had again been done through the post, discussion was fairly limited. A motion put forward by the Hornsby club promoting specific braking standards was convincingly defeated after some lively debate. At one stage debate was interrupted as some people sought higher ground when water started flowing through the tent. Some alternative suggestions relating to braking policy will be circulated later in the year.

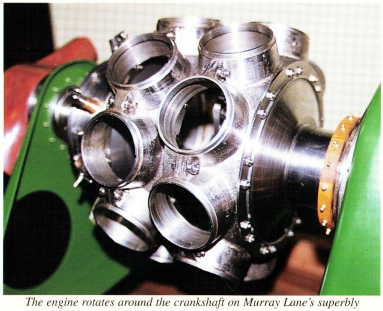


The members of the Lake Macquarie club are justifiably proud of their spacious new 7¼" gauge station (also known as the "Opera House") Photo: Peter Polson

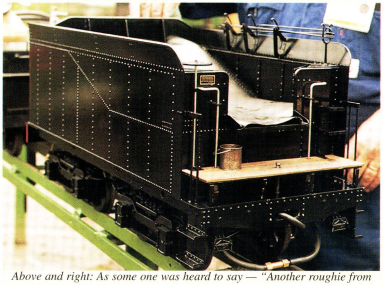
Sunday

By this time the ground was really churned up. It was interesting to see how people improvise when the chips are down. There were people walking around over the three days with plastic bags on their feet and people wearing garbage bags which had openings cut for head and arms. Several locos were on the track again and people were enjoying themselves as usual. Actually, there would not have been too many which did not get out on the track at some stage.

After dinner on Sunday, it is traditionally time for the awards to be presented and the odd speech to be made. Everyone



The engine rotates around the crankshaft on Murray Lane's superbly crafted 18-cylinder Monosoupape aero engine Photo: D Proctor



Above and right: As some one was heard to say — "Another roughie from Potter!". Barry's D55 class is to a high standard as usual. Photos: G Mol

was issued with a lucky number ticket on entry and many of them won prizes as numbers were drawn during the meal. After dinner was over, Australian souvenir gifts were presented to the overseas guests from New Zealand, and Harry Bean from the USA.

The **Bolton Trophy** for the best model of an Australian prototype was awarded to Max Faulkner from QSMEE for his 7¼" gauge model of a Queensland Railways BB18¼ class locomotive. The **SSME Trophy** for the most popular locomotive went to Barry Potter for his NSWGR D55 class standard goods engine.

The **Southern Federation Award** for a person who has made a major contribution to the hobby was awarded to Bill Belton from the Tullamarine club in Victoria.

The **AME Under 25 Encouragement Award** was presented to John Tulloch for his NSWGR 'P' class tender. If the completed locomotive is as good as the tender it will be a magnificent model, and perhaps a future Bolton Trophy winner.

After the meeting the weather cleared to a lovely starry night for running, interrupted only by the hoardes of tiny tortoises crossing the track.

Thankyou, Lake Macquarie for a most enjoyable weekend. Next year it will be the Sunshine State's turn. Convention 2000 will be hosted by the QSMEE at Warner (Brisbane), from 21 to 24 April, and that's about as late as Easter can get.

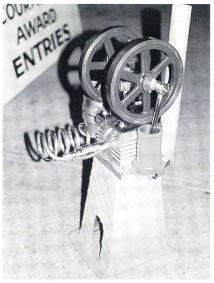
AME Under 25 Encouragement Award

This year there were five entries in the Under 25 Encouragement Award from three entrants. Andrew Allison from the Sydney Live Steam Locomotive Society entered a very nice tender chassis for a 5" gauge QR A-10 class locomotive and a 5" NSWGR "S" truck as per the design in AME March-April 1995, but beefed up to serve as a driving truck. Andrew is 13 years old. John Tulloch, 22 years old, also from the SLSLS, entered the tender and front bogie for the 5" gauge NSWGR 'P' class locomotive which he has under construction, and it should make a very nice model when completed if John keeps up this standard of work. The third entrant was 21 year old Timothy Scheele from Townsend on the NSW north coast. Timothy submitted two entries, a single cylinder horizontal mill engine, made when he was 16 years old, and a Heinrici hot air engine built when he was 18 years old, both really well made models.

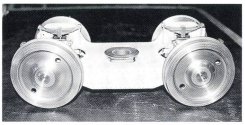
The judge had a difficult task, considering the outstanding workmanship displayed by all three entrants and the differences in ages. It was very difficult to choose from Tim's Heinrici, Andrew's tender chassis, and John's tender. In the end the decision was made to award the trophy and the prize to John Tulloch for his P class tender. The prize this year, again donated by Hare & Forbes, was a set of Micrometers. One of the local firms donated consolation prizes which went to the two runners up.

I would like to congratulate all three entrants on the standard of their work, and thank them for submitting them for judging. Sometimes it is unfortunate that there can be only one Award winner, but I reckon that with the standard of work these three young men are producing, in the long term they are all winners. Also, guys, there is always Brisbane next year! Thanks also to our judge who will remain anonymous, and to Hare & Forbes for their ongoing support for our hobby.

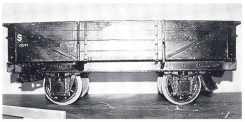
David Proctor



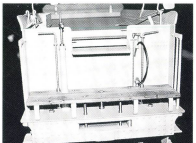
Tim Scheele's Heinrici hot air engine



John Tulloch's P class bogie

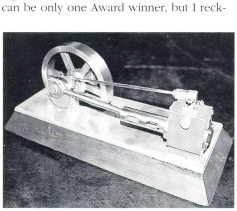


Andrew Allison's S truck driving truck

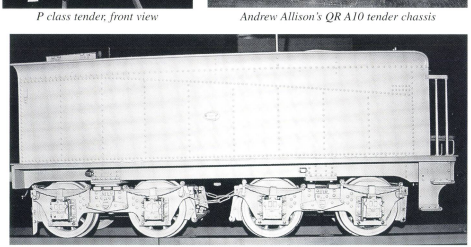


P class tender, front view

Andrew Allison's QR A10 tender chassis



Tim Scheele's horizontal mill engine



John Tulloch's winning NSW P class tender

All photos: David Proctor

Sparks 'n' Arcs

with Stan Allison

Notes on batteries for model traction

Batteries used in model traction service have a hard life and are the weak link in the 'chain'. A loco battery may be used to the point of being discharged even though the loco may be run in an effort to achieve a reasonable day's running time. It may also be a day or two before the battery is recharged and the recharge rate may be too low.

Sulphating is the killer and when the battery is less than 80% fully charged the battery plates are slowly covered with a material that inhibits the active plate material. It is not unusual for automotive batteries to last up to five years of daily use. A modern auto has an alternator that brings it battery back to full charge within minutes of a short heavy load being applied. Also the battery is in effect trickle charged during ordinary running at an ideal voltage centred on 14.5 volts. Another feature is that auto batteries hardly ever need topping up with distilled water - say no more than once a year.

It is interesting to read an auto maker's workshop manual on batteries. For my auto, the Workshop Manual simply calls for a 12 volt battery with a cold cranking capacity of 390 amps - no amp/hour or plates per cell figures. Presumably if the battery will crank at 390 amps it will do anything else asked of it.

Referring to a discharged loco battery the following is a summary of the points of importance when re-charging:-

Specific gravity of electrolyte (SG):

1.240 - 1.260	100% charge
1.210 - 1.240	75% charge
1.180 - 1.210	50% charge
below 1.130	discharged

Any cell(s) varying more than 0.025 indicates an internal fault

My advice is to check SG every 2nd or 3rd charge cycle by measuring only one cell. Check all cells say every 8-10 cycles.

Ideally the charge cycle should consist of

- 4-5 amps until the battery starts to gas or reaches 14.5 volts or at least 75% charge SG, which ever comes first (12 to 24 hours). *This should be done as soon as possible after a day's run.*
- Transfer the battery to a floating charge at 14.5 volts (for a 12 volt battery) (See AME issue 75, page 25 for a Regulated Charger by Bill Carter). The float charge can be left on continuously and tends to correct minor sulphating.
- At no stage of the recharge should the battery or a single cell rise to a temperature of 45°C. If this happens, reduce the charge. You will be able to judge the 45°C by placing your hand on the side of the battery — it will feel 'decidedly warm'. Normally a charging battery should feel no more than 'faintly warm' — you will soon get used to the feel. If you are not sure, then it is too warm.

The above points may seem a lot of bother but after a while it will become a simple routine. *Charge batteries singly or in series but not in parallel.*

A working loco battery would benefit greatly by being connected to an auto alternator of 65-85 amps output and driven at 4,000 to 5,000 rpm by say a 3HP engine. A loco would give a noticeably better performance. This arrangement would not come cheap but then the whole loco is a substantial investment. Space-wise the engine/alternator might need to be carried in a trailer. ("dawn to dark" running), or perhaps the engine/alternator (club owned?) could be used track side to top up loco batteries in between runs.

A larger engine could perhaps drive both a 12 volt and a 24 volt alternator if used track side or perhaps an electric motor could replace the engine if AC power is available.

An alternator will charge a battery much faster than an ordinary battery charger because of its rigid output voltage control. An auto alternator's output is centred on 14.5 volts for 12 volt charging or on 29 volts for 24 volt charging. Alternators are self protected against overload and operate when rotated either clockwise or anti-clockwise.

(Engine/alternators may be in use already but I have not heard of it.)

DC traction motors — notes

Of the three types of DC motors mentioned in the last issue, the series motor is clearly superior for traction service. The remarks on Back EMF (last issue) apply to the three types of motors, but the response of a series motor to an applied shaft load is slightly different to the response of Permag and Shunt motors.

When a series motor is loaded the RPM is reduced as is the Back EMF and more current flows through the armature and the field. The field being thus strengthened increases the Back EMF slightly and the armature RPM drops a little further until the armature develops enough torque to meet the new loading. This is a smooth cumulative interaction and the result of *further* loading is increased armature current and field strength until the motor finally stalls. At this point the armature is at maximum torque: an ideal feature for starting under load.

However, this speed versus load feature, allows a series motor to *speed up under reduced load.* In full scale practice this could allow a suburban train to gather excess speed on a decline if kept under power, so the practice is to coast on a decline using mechanical brakes to check over-speed. This is because a series motor, has no in-built ability for braking and needs special switching of the field coils and the armature if 'motor' braking is found to be necessary, eg. heavy goods service on long down grades. Diesel-electric and electric locomotives have 'motor' braking and feed the regenerated/dynamic power back to the engine generator or the overhead contact conductor, or to waste as heat.

In model locomotives, it is debatable whether 'motor' braking is worth the circuit complexity or series motor drives as slopes on model rail tracks are relatively gentle.

A further feature of series motors is their ability to cope with lower than normal supply voltages by simply maintaining their torque at a lower speed (RPM). Another perhaps astonishing feature, is their ability to withstand a short circuit being slapped across a working loaded motor provided there is control over the amount of line current that can flow. More on this in a later issue. These two features make it practicable to switch multiple motors from series to parallel or back to series without a break in the delivery of torque to the vehicle axles. (Electric locomotives can have a motor on each of six axles and the motors can be switched in series, series-parallel or parallel depending on the load/speed conditions.)

There are a number of 'safe-guard' circuits in full scale practice but circuits can be simpler on model locomotives.

In the next instalment we will look at adapting shunt motors/generators to series use. In the meantime I suggest you read Arthur Richard's article on this subject on page 23 in A.M.E. issue 74.

Those cursed gremlins —

In the last issue, column 2, a line of formulae appeared as

$$W = EI \text{ or } W = I2R \text{ or } W = E2/R$$

It should have read

$$W = EI \text{ or } W = I^2R \text{ or } W = E^2/R$$

Mixed Gauges at Park Ridge

by Dave Harper and Ron Calver

photos by Dave Harper

The article by Gerardus Mol in the May-June 98 issue of AME, titled *A Day in the Park* prompted a phone call from Ron Calver. Ron said that he had some drawings of 4-wheel carriages similar to the ones shown in the photos being rescued from the park in Ipswich, as requested by the Editor. The carriage drawings comprise 4 sheets showing two alternate carriage bodies, a goods/brake van body and an underframe drawing. They appear to have been printed from archive microfiche, and may not be suitable for reproduction, but certainly provide a start for anyone considering building a small 3½" carriage *(Contact the AME office for details ... Ed)*

Ron also told me that on his acreage at Park Ridge, south of Brisbane, he had a 7¼" gauge track as well as some 2ft gauge line with a couple of old cane locos. What really clinched the idea of me going to see him was when he told me he also had a drawing of the bogie of a QR railmotor similar to *Red Fred!* This was one part of my *Red Fred* project that had been bothering me, so it only took a week or so to find a free day when my wife and I could drive across town to see Ron's spread. The bogie drawing is for a Napier railmotor, but checking it with my photos of *Red Fred*, it looks near enough for this feller!

We duly arrived to find that Ron and his son Aaron, together with friend Paul Smith, had set out a whole range of models on the 7¼" gauge track ready to give us a demo. Ron's pride and joy were the two electric powered models of Tasmanian trams which are powered by 12v Bosch car generators and controlled by varying resistors through a series of ex-GPO relays. **Photos 1** to **3** show the two trams and the battery and relay setup, looking a bit weathered after quite a long and active life.

Paul had his freelance diesel loco set up hauling a couple of loads of timber and two pas-

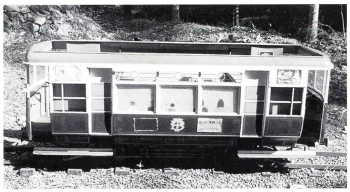


Photo 1

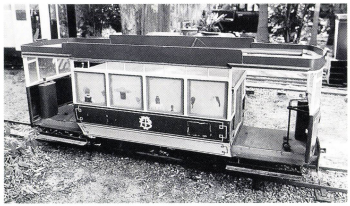


Photo 2

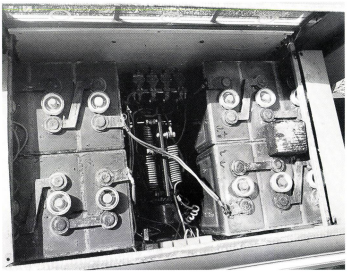


Photo 3

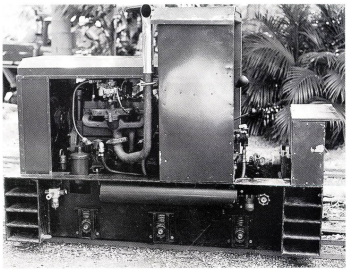


Photo 4

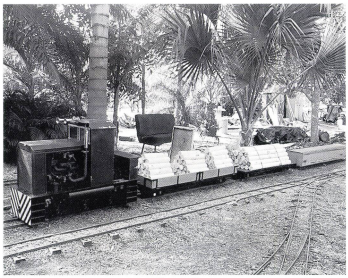


Photo 5

senger cars. **Photos 4** and **5** show Paul and his train. The loco is powered by a Ford 100e engine with a cut-down gearbox and has air brakes from a truck.

Also on the track was a neat diesel loco and wagons belonging to Graham Finter, this one being Honda powered **(photo 6)**. Graham also apparently owns the two Ruston Hornsby 2ft gauge cane locos; these were acquired from Hayman Island in the Whitsundays, where they were apparently used to haul tourists around. They certainly seem to have suffered some corrosion through being in such a salty environment, but Ron is confident they can be reworked in due course. Both locos have been re-engined at some time, one with a 4-cyl Lambardini diesel, and the other with a three cylinder Perkins 3152 diesel (**photo 7**).

Also of interest was the old coal wagon from an Ipswich coal mine, which is an odd gauge of about 21", and has grooves worn in the ends where the miners hands pushed it for many years (**photo 8**). Ron also has an old kero tank mounted on a 4 wheel chassis to act as a water tanker when the 2ft gauge track comes into use.

Thank you, Ron, Aaron and Paul, for an interesting couple of hours and the opportunity to see your handiwork.

(Shortly after this article was set up in the magazine I received a For Sale ad from Ron and Graham, who are disposing of some of these items. See the classifieds in this issue ... Ed)

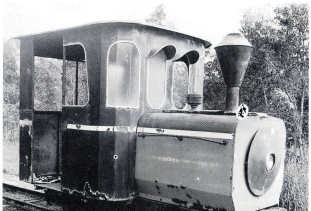


Photo 7

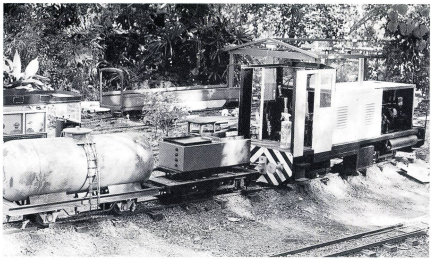


Photo 6

Photo 8

Remember the A10 class loco, 4 wheel passenger car and guard's van which featured in the article *A Day in the Park* in the May-June 1998 issue, when they were removed after, many years in a park in Ipswich, and taken to the Ipswich railway workshops for restoration by Queensland Rail?

This photo shows the 4-wheel passenger car as it looks now, after restoration. The job included an all new steel under frame and all new cedar windows.

For the modeller, this little 4-wheeler would look great behind any of those Queensland A10s to be seen throughout the country or indeed, behind any vintage locomotive modelled on a 3'6" gauge prototype..

A Model Speed Calculator

by Jim Gray

The idea for this calculator came about during the design of a 7¼" gauge petrol-electric drive diesel outline locomotive. It soon became evident that to obtain the optimum values for such things as wheel diameter, drive reduction ratio and motor speed, a simple spreadsheet would be the way to go. The spreadsheet originally consisted only of a small section which, when the wheel diameter, drive ratio and motor speed were entered gave the wheel RPM and the road speed in MPH; (I am old enough to remember what miles are).

With this section up and running, it then seemed logical to extend the capabilities of the calculator with the result that, in addition to the wheel RPM, it is now able to provide wheel circumference (both metric and imperial), distance travelled (feet or metres per wheel revolution), wheel revolutions (per mile or kilometre) and the road speed in MPH and KPH. The table shown on the right of the calculator was an add-on to provide an instant readout of motor RPM to road speed when a change is made to the wheel diameter or drive ratio. It can be omitted if not required but more about this later.

How does it work?

The spreadsheet is written in Microsoft® Excel® (Ver. 5.0c), which is an easy to learn and easy to use spreadsheet, although I am told that it should be simple to adapt it for use in most other spreadsheets. This is not to suggest that Excel is the best spreadsheet around; it is just the one I have on my computer. Incidentally, I have not tested it on earlier versions of Excel so you may have to make some changes if you are running an earlier version.

As can be seen from the accompanying diagram (below), the program fits on one screen so no scrolling is necessary to move around the sheet. For the speed calculator, only three "boxes" (cells) are used for entering data — Wheel Diameter, Drive Ratio and Drive Motor RPM. The calculations are all performed using imperial values so a simple Metric/Imperial converter is included which will convert from one to the other in either direction via the data entry "boxes" on the bottom two lines.

Entering the program

If you are unfamiliar with spreadsheets, they can sometimes appear very confusing but in practice are generally quite simple to work with. For the uninitiated, they consist of vertical columns and horizontal rows. The columns are usually designated by letters A,B,C...etc. while the rows are designated by numbers 1,2,3...etc. Obviously we can go for a long time before we run out of rows (which are numbered) but we run out of columns when we get to Z. All is not lost however; the columns are then designated as AA, AB, AC...etc. and this continues all the way to ZZ which gives us a lot of columns to use if they are needed. Fortunately as this program is so small, we need only use 15 columns (10 if you are only going to use the speed calculator) and 18 rows.

Having this combination of columns denoted by letters and rows denoted by numbers gives us a method of being able to refer to any cell on the sheet by a letter/number combination. For example, the first cell on the sheet is referred to as A1, the next one along as B1 etc. Referring to the table on the next page, it will be seen that there are four columns headed "**C**", "**R**", "**CELL FORMAT**" and "**CELL ENTRY**" which by now, astute readers will have deduced stand for **COLUMN, ROW**, how the various cells are **FORMATTED** to obtain the results and the appearance we want and lastly, the data that must be typed into each cell (**CELL ENTRY**). *Please note that all the formulae in the* "CELL ENTRY" *column must be typed into their respective cells exactly as they appear in the column.*

Cell formatting is another function in which various parameters can be set to make the spreadsheet easier to use and understand. Some of the formatting functions used in this program are font and size, cell alignment and number format. For example, cell H4 is formatted "number, 3 decimal places, aligned right", cell H5 is formatted "number, 2 decimal places, aligned right" while cell H6 is formatted "number, 0 decimal places, aligned right". The font used is Times New Roman, 8pt.unless noted separately in the table.

RPM/Speed Table

As mentioned in paragraph 2, with regard to the table shown on the right of the print-out below, it is entirely optional as to whether this is included or not. This table can be used to calculate the RPM/SPEED relationship for any drive system in which the wheel diameter and drive ratio is known. For example if you were interested in knowing this relationship for a steam locomotive (unless it is a Shay, Climax, Heisler or some other geared loco), entering a value of 1 in the Drive Ratio box will give a read-

MODEL SPEED CALCULATOR

IMPERIAL					
Wheel Diameter	6.000	**inches**	**Circumference**	18.850	**Inches**
Drive Ratio	5.00	**:1**	**Distance**	1.57	**Feet/rev**
Drive Motor	4000	**RPM**	**Distance**	3361	**Revs/mile**
Road Wheel	800	**RPM**	**Speed**	14.28	**Miles/hour**

METRIC					
Wheel Diameter	152.40	**mm**	**Circumference**	478.78	**mm**
Drive Ratio	5	**:1**	**Distance**	0.48	**Metres/rev**
Drive Motor	4000	**RPM**	**Distance**	2089	**Revs/Km**
Road Wheel	800	**RPM**	**Speed**	22.98	**Km/hour**

METRIC/IMP CONVERSION				
In to mm	6.000	**inches**	=	152.40 **mm**
mm to In	152.40	**mm**	=	6.000 **inches**

MOTOR	MPH	KPH
250	0.89	1.44
500	1.78	2.87
750	2.68	4.31
1000	3.57	5.75
1250	4.46	7.18
1500	5.35	8.62
1750	6.25	10.05
2000	7.14	11.49
2250	8.03	12.93
2500	8.92	14.36
2750	9.82	15.80
3000	10.71	17.24
3250	11.60	18.67
3500	12.49	20.11
3750	13.39	21.55

out of the speed over the ground for various wheels speeds. If you require the information for a different series of wheel speeds, it is a simple matter to change to these using the 'Fill' function. It could even be used to find the engine/wheel speed relationship for a car by entering the crown-wheel/pinion ratio for (top gear figures) or by multiplying this ratio by the intermediate gear ratios for the speeds in the various gears. These ratios are usually found in the vehicle specifications.

If you decide not to include it, do not type anything into cells L2, M2 and N2 or L3, M3 and N3. If you do decide to use it however, with Excel there is a much easier way to get data into the cells than laboriously typing it into individual cells. Excel has a function called "Fill" which is accessed from the "Edit" menu and can be used to advantage in this situation. Use the "Fill Series" together with the "Step Value" functions to fill the "L" column while the "Fill Down" function can be used to fill columns "M" and "N".

The column formats used in the table are:

- for the L column, number 0, align centre,
- or the M column, number 0.00, align centre,
- for the N column, number 0.00, align centre.

The starting number in the L column can be any value desired. For example the starting number shown is 250 RPM with 250 RPM increments up to 3750 RPM in the table and 4000 RPM in the calculator. This can just as easily be increments of 100 RPM or whatever range suits your purpose.

Testing the program

When all the data has been typed into the correct cells, the program can be tested. In their respective entry boxes, type in values for the wheel diameter, drive reduction ratio and drive motor RPM. Remember that the wheel diameter must be entered in inches; if your wheels are finished to a metric diameter, use the conversion facility at the bottom of the calculator to convert to inches.

If you have Excel® set up for Auto Re-calculation, the program will automatically calculate the imperial values in the upper section for the Road Wheel RPM, Circumference, Distances in Feet/Rev and Revs/mile as well as the corresponding metric values in the lower (Metric) section. If you have set up the RPM/SPEED table as well, the speeds in MPH and KPH (corresponding to the motor speed series you have chosen) will also be displayed.

Protection and appearance

A useful feature of Excel which should be used in this application is the 'Protect Sheet' function. This will prevent you from inad-vertently typing something into the wrong cell and possibly not realising the error until you discover you have lost an important formula. The only cells to remain unlocked are 'Wheel Diameter', 'Drive Ratio' and 'Drive Motor' boxes in the upper left (IMPERIAL) section and the 'In to mm' and 'mm to In' boxes in the 'METRIC/IMP CONVERSION' calculator.

If you are not concerned with the final appearance of the calculator, you can leave the sheet just as it is. It will still work quite happily with no alterations. One advantage however of altering the appearance by enclosing the various individual entries in coloured 'boxes' is that, apart from being pleasing to the eye, they are immediately recognisable as to their purpose. On my own screen, I have used light blue for the background, green for the results and units boxes and yellow for the data entry boxes.

Placing thicker lines as borders around the outside of the working area and section separation lines of the same thickness also enhance the appearance and generally give a more 'professional' looking presentation,

C	R	CELL FORMAT	CELL ENTRY
D	2	align left, 12pt Arial, bold	MODEL SPEED CALCULATOR
L	2	align centre, 10pt Times N/R	MOTOR (see text)*
M	2	align centre, 10pt Times N/R	MPH (see text)*
N	2	align centre, 10pt Times N/R	KPH (see text)*
C	3	align centre, 10pt Times N/R	IMPERIAL
L	3	align centre	speed range start number (see text)*
M	3	number 0.00, align centre	=((L3/$D$5)*60)/$H$6 (see text)*
N	3	number 0.00, align centre	=M3*1.609344 (see text)*
C	4	bold, align right	Wheel Diameter
D	4	number 0.000, align right	(No text - Wheel diameter entry box)
E	4	bold, align left	Inches
G	4	bold, align right	Circumference
H	4	number 0.000, align right	=PI()*D4
I	4	bold, align left	Inches
C	5	bold, align right	Drive Ratio
D	5	number 0.00, align right	(No text - Drive ratio entry box)
E	5	bold, align left	:1
G	5	bold, align right	Distance
H	5	number 0.00, align right	=H4/12
I	5	bold, align left	Feet/Rev
C	6	bold, align right	Drive Motor
D	6	number 0, align right	(No text - motor RPM entry box)
E	6	bold, align left	RPM
G	6	bold, align right	Distance
H	6	number 0, align right	=63360/H4
I	6	bold, align left	Revs/Mile
C	7	bold, align right	Road Wheel
D	7	number 0, align right	=D6/D5
E	7	bold, align left	RPM
G	7	bold, align right	Speed
H	7	number 0.00, align right	=((D6/D5)*60)/H6
I	7	bold, align left	Miles/Hour
C	9	align centre,10pt Times N/R	METRIC
C	10	bold, align right	Wheel Diameter
D	10	number 0.00, align right	=ROUND(25.4*D4,2)
E	10	bold, align left	mm
G	10	bold, align right	Circumference
H	10	number 0.00, align right	=PI()*D10
I	10	bold, align left	mm
C	11	bold, align right	Drive Ratio
D	11	number 0.00, align right	=D5
E	11	bold, align left	:1
G	11	bold, align right	Distance
H	11	number 0.00, align right	=H10/1000
I	11	bold, align left	Metres/Rev
C	12	bold, align right	Drive Motor
D	12	number 0, align right	=D6
E	12	bold, align left	RPM
G	12	bold, align right	Distance
H	12	number 0, align right	=1000000/H10
I	12	bold, align left	Revs/Km
C	13	bold, align right	Road Wheel
D	13	number 0, align right	=D7
E	13	bold, align left	RPM
G	13	bold, align right	Speed
H	13	number 0.00, align right	=((D12/D11)*60)/H12
I	13	bold, align left	Km/Hour
C	15	align left, 10pt times N/R	METRIC/IMP CONVERSION
C	16	bold, align right	Inches to mm
D	16	number 0.000, align right	(No text - Inches entry box)
E	16	bold, align left	Inches
F	16	bold, align centre	=
G	16	number 0.00, align right	=ROUND(D16*25.4,2)
H	16	bold, align left	mm
C	17	bold, align right	mm to Inches
D	17	number 0.00, align right	(Nil - mm entry box)
E	17	bold, align left	mm
F	17	bold align centre	=
G	17	number 0.000, align right	=ROUND(D17/25.4,3)
H	17	bold, align left	Inches

especially when printed out. As Excel gives you a choice of several line thicknesses and colours, you can make your finished product as attractive as you like.

Row and column sizes

The following tables give the column widths and row heights used in the prototype. If these values are used, your screen (and print-out) should look like the example shown. If you decide that you do not require the RPM/SPEED table section, simply omit the last five columns (K,L,M,N and O).

COLUMN WIDTHS

A	B	C	D	E
1	4	8	7	5
F	G	H	I	J
5	8	6	9	1
K	L	M	N	O
1	7	5	5	1

ROW HEIGHTS

1	2	3-17	18
8	16	13	6

It is estimated that the average person would take between 2 and 3 hours to enter the program and set it up to look pretty. For this reason, AME is offering the program on disk (PC format only) to save you all that work. To get a copy of the program on disk, simply send a blank 3.5" diskette and a stamped self-addressed envelope to the AME office at:

PO Box 21, Higgins. ACT 2615

Alternatively if you wish, we can email the program to you for no cost at all. Contact us on

ame@dynamite.com.au *with your email address*

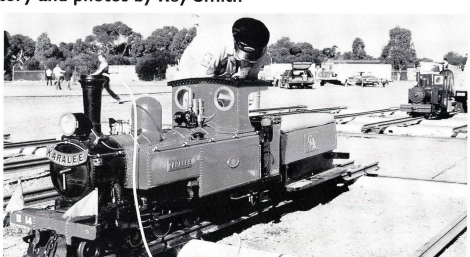
Bay Watch!

Ideas for the design and safe operation of steaming bays — part 2

Story and photos by Roy Smith

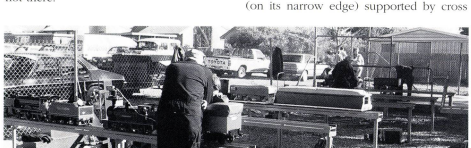
There are other reasons for this degree of separation though — ever stood by your loco when your neighbour was playing with a temperamental injector, or worse still, blowing down his boiler? You occasionally get that wet feeling down the leg and in your shoe and even considering one's age, it's not incontinence. Despite the nuisance value of the water or condensate getting in your toolbox, supplies and boots, there is the danger of hot water burns.

The **length** of each bay will be governed by space — with the proliferation of larger locos, steaming bay space at conventions and large invitation runs is often at a premium — Tullamarine had to put in temporary bays back in 1988 for 7¼". They were so useful, those extra bays were still in use in for the 1992 convention! More than two locos per bay can be a real pain, particularly if you are at the outer end and the other fellas haven't come back from lunch — I don't like moving other peoples' engines when they're not there.



For the 1988 convention, Tullamarine laid some temporary additional steaming bays out in the back paddock for 7¼" gauge using 14lb rail on steel pipe sleepers. The beautiful 'B' class 4-6-0T hails from WA and is using compressed air to raise steam.

How about bay **construction**? They are mostly raised, open metal structures usually consisting of some RHS or flat bar (on its narrow edge) supported by cross braces on columns at regular intervals and with a few tie bars to maintain gauge. Bays should be level but if there is any slope, it should be towards the buffer stop at the back of the bay, not towards the turntable pit.



The spacing between Canberra's bays is excellent and the height is good also (1994)

The average size of miniature locos has grown over the years and it appears that they are still getting bigger and not just in 7¼" gauge. Therefore, the earlier, slender constructions seen at some tracks may no longer suffice. The bays themselves have to act as bridge spans to support the weight of the locos whilst giving sufficient space between vertical pillars to allow you reasonable access underneath.

There is not just the weight of the loco on top to take into account, the uprights must have good solid foundations to resist sideways movements when people lean heavily on them or they take a good wal-

loping. The most consistent abuse is using the bay to brake the motion of the turntable or traverser by dropping in the lock as the roads line up. This happened on the full size also, resulting in the fitters having more work to do taking up the locking assembly wear to get the track alignment back again!

If the ground under and around the bays is concreted, you have a better chance of finding the small pins, nuts or whatever you will inevitably drop! Forget them if the ground is loose gravel or grass! Concrete is easy to hose down and sweep clean.

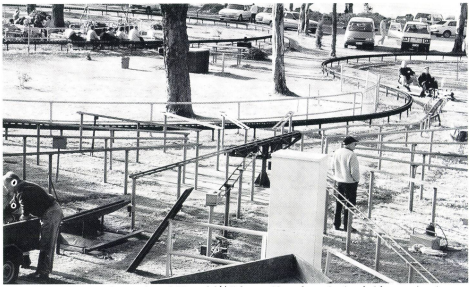
There is a problem with access to the underside of locos when bays are **multi-gauge** — those five-inch rails get in my way, particularly when oiling up or later, when dropping the fire. I'm sure that the five inch brigade don't enjoy having the extra rails outside either. This is worst when the roundhouse shed layout is used — with a traverser, at least you only need one extra rail for dual gauge.

Unfortunately, it is difficult to state any guidelines as to how much bay space should be allocated to each gauge as club loco rosters are generally never static. One option is to have separate roads or even areas for each gauge — a couple of the larger tracks such as the Newcastle, Castlederae and the old Tullamarine site have (had) this. But not too far apart — it's nice to be around old friends, particularly when you can only cross paths at conventions.

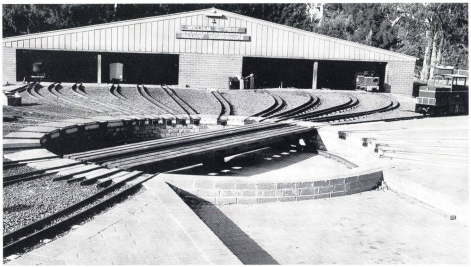
This is probably a good time to say something about the 2½" and 3½" gauge requirements. If they cater for the smaller gauges, some clubs put the elevated tracks to one side, away from the main ground level track. This creates a feeling of isolation during conventions. The only advantage of this arrangement is possibly easier access to the small gauge steaming bays.

Where elevated tracks are placed in the middle of the ground level tracks, it is important that locos and stock can be easily moved to the steaming bays if the unloading is done remote from the bays. Don't expect an owner to carry his loco over the ground level tracks to the elevated track bays — we geriatrics aren't as strong as we used to be and help is not always available when it's needed.

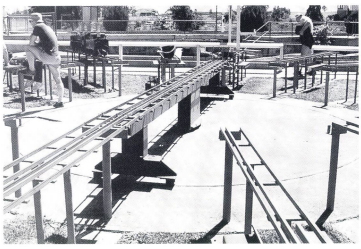
A common way, particularly in England, of getting small gauge locos from their bays onto the track is via a traverser



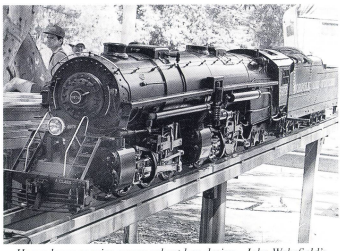
Newcastle, showing the combined 5" and 3½" bays. Note the swinging bridge section (upper right) that allows 3½" gauge locos to access the elevated track from the bays



The magnificent turntable and shed at Diamond Valley, the sunken brickwork in the foreground forms the unloading pad. The turntable can be raised to match the height of vehicles



The problem of combining multiple gauges with turntables! Despite its apparent complexity, Luddenham's system is reasonably easy to use. Take note of the robust construction of the turntable itself.



Heavy locos require a very robust bay design. John Wakefield's N&W 'A' class Mallet is only 5" gauge, but weighs as much as many 7¼" locos

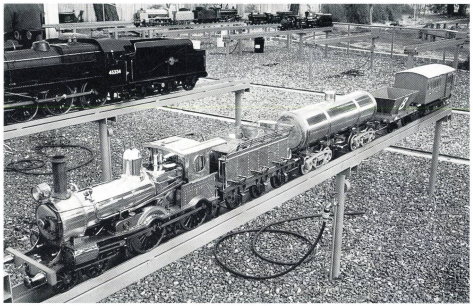
which becomes part of the main line by locking it at both ends to fill a gap in the elevated track. Unfortunately, this means that while someone is running around the track, no-one else can use the traverser and while the traverser is being used to move locos, no-one can safely run around the track!

A way around this is to use a curved lifting flap that has tapered rail ends such that it is lowered onto the top of the main line rails so a loco can run down the tapered rail ends smoothly onto the elevated track. This may sound cumbersome but it appears to work well (eg. Illawarra).

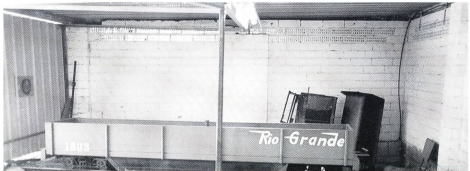
Other than location, access to the bays for unloading and getting from the bays to the track, the requirements of the smaller gauges are generally similar to the larger ones.

Covered bays are a luxury but worth thinking about — in particular I remember a visit to a private Blue Mountains track, then owned by John Green. Everything under cover — luxury! And it's not just rain that you need to keep out of — a bit of shade goes down a real treat in summer!

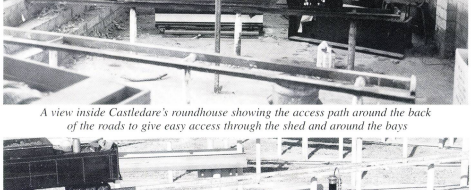
Some tracks give the impression of a real straight shed (Diamond Valley) or roundhouse (Castledare) by having the floor level within the building below track and ground level. A very nice effect and worth the effort! If you want to have a covered shed, either straight through or sector style, the tracks need to stop well short of the rear wall to allow good access around each bay — if a road has to continue out through the back wall, have a removable or lifting track panel to allow safe walkway access when required.



Canberra has 12 volt power on the centre post of each bay and a water tap on every second bay. The beautiful 12 class loco and rolling stock were built by the late Walter Shellshear



A view inside Castledare's roundhouse showing the access path around the back of the roads to give easy access through the shed and around the bays



A fine 17 class at Luddenham. Note the shelves on the sides of the bays — a very useful step

Storage facilities

One of my biggest gripes would have to be storage, or lack of, for my kit at virtually any track I have had the pleasure of visiting. Normal practice is to leave the toolbox and supplies under the steaming bay allocated to me but I may not be the only person using that bay, particularly during a convention or a busy running day. Left there, they are at the mercy of others less considerate and it is not uncommon to come back to find the kit covered in ash, water and oil! Please think about providing nearby shelves or receptacles that can be used for the orderly storage of people's kits — you'll win hearts and minds if you do!

Another neat addition would be a small work bench at the end of at least every second bay so we can do 'running shed' repairs without having to clog the workshop! Luddenham have small benches or shelves along the sides of their bays — that's a good start!

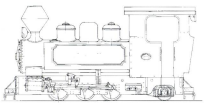
Washing facilities for grubby crews are a nice touch. Even better if loos and changerooms are also available nearby! Forget about barracks though — I've had enough of those! If I need to stay overnight nowadays, a motel does just nicely, thanks!

Lighting

Like roofing, this may seem to be extravagant but when winter is here, darkness sets in early. Don't cut your driving time short simply because you have no lighting to pack up under. Lighting is essential for holding night runs and is good safety as much as it is useful.

To be continued ...

Bunyip



A Bundaberg Fowler 0-6-2T in 7¼" gauge — part 7

by Ian Smith

Drawings and photos by the author unless credited otherwise

Brackets for expansion links

These are right and left hand castings very similar to the valve spindle bracket, so the machining is very similar. Set the bracket up on the milling machine on parallel strips with the web facing down and the base parallel to the table travel and machine the boss face to 0.8mm above the side of the bracket. Now take a cut off the base using the side face of an end mill, measure the centre of the boss to the base (it should read 54mm — if not machine to size), then take a cut off the top of the bracket using the cross travel till it reads 39.7mm to the centre of the boss, turn over and machine the other side of the boss bringing the width to 12.5mm. Using the same set up as for the valve spindle bracket, drill and ream the bore to 16mm, make the bronze bush 16mm OD x 12mm ID x 12.5mm long and press into bracket. Drill tap 6mm x 8mm deep the boss for the oil cup and drill the 1mm oil hole through the bush.

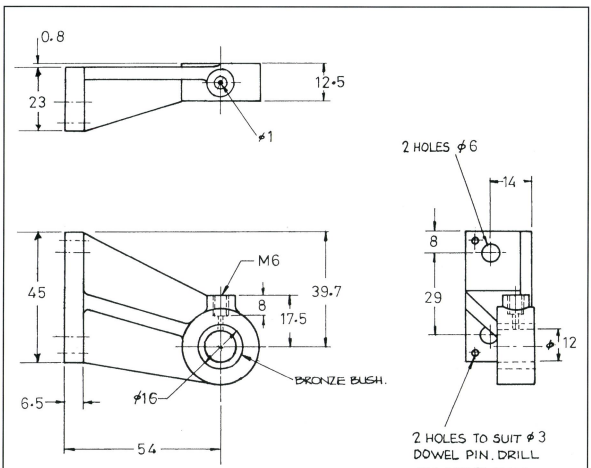
Mark out for the two 6mm holes 14mm in from the side and 8mm down from the top side and 29mm apart.

Expansion links

The expansion links are made from 20mm x 40mm BMS. Cut two pieces 68.5mm long, and two pieces 115mm long. Clamp the rotary table (I have a 305mm diameter table) to the vertical milling machine table. In the centre hole of the rotary table place a suitable locating bar with a 12mm diameter end protruding. It is to locate the jig on the rotary table for milling the expansion link blanks.

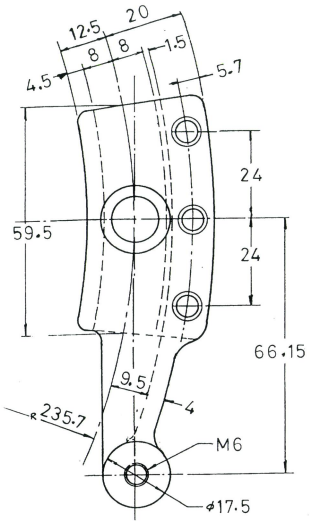
I used a piece of 75mm x 32mm x 572mm aluminium bar to make the machining jig to hold the expansion link blanks but you can use BMS and or any suitable size that will hold the blanks securely without vibration when machining. Drill and ream a 12mm hole in the centre of the bar, and holes to match the slots in the rotary table for clamping the bar as close as possible to the periphery of the table (but not so as to interfere with the clamping of the blanks in the your milling jig). I have machined one step at a time on each expansion link before going on to the next operation.

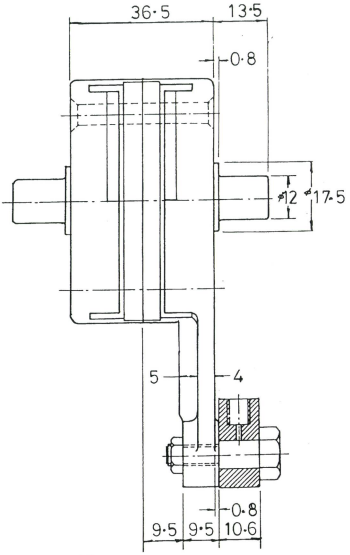
To set the milling cutter head central to the rotary table, use a finger dial indicator. Clamp dial indicator in milling cutter holder, set the finger of indicator on the 12mm spigot and rotate the dial indicator around the 12mm spigot until the it is centred, write down the dial readings in both directions — now all measurements can be taken

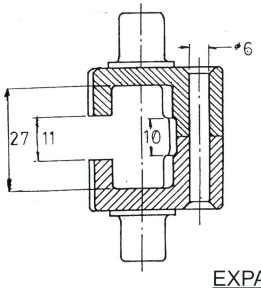


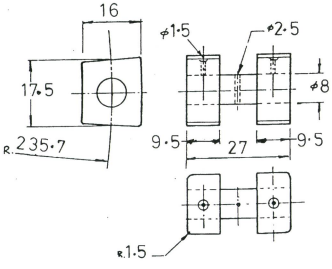
CAST IRON BRACKET FOR EXPANSION LINKS

2 OFF L.H. & 2 OFF R.H. PER LOCO









EXPANSION LINK

1 OFF L.H. & 1 OFF R.H.

DIE BLOCKS & PIN

from these settings.

Move the milling table to read 235.7mm radius, take a trial cut with a 10mm end mill 5mm deep, rotate the rotary table 360°, check the setting with a Vernier and write the dial reading down. This is the setting of the slot and the setting of the pivot pins.

Set the aluminium bar parallel to the table travel. The slot for holding the expansion link can now be machined in one end 40.5mm wide x 12mm deep (**photo 1**), move the cutter back to towards the centre of the rotary table 17.5mm and machine to a depth of 12mm. Now machine the other way till you have a 40.5mm wide slot. There should be enough material left on the end of the bar to drill and tap three M8 holes to take 8mm cap screws. Put a 10mm slot drill in the milling head and set the milling table back 235.7mm radius and also set the cross slide so the cutter is back on the centre line of the rotary table, then lock the both table and cross slide so they cannot move. Clamp the short expansion link block in the center of the slot milled in the bar. Scribe a line in the slot at each end of the block so the other blocks can be set to the same position, using a 10mm slot drill machine the expansion link to a depth of 13.7mm while rotating the rotary table (**photo 2**). Recheck the radius with the Vernier caliper. That is reason for machining 10mm slots in each end of the bar to start with, to be able to check for the correct radius at all times.

Rotate the expansion link till the cutter is in the centre of the slot length ways and lock the rotary table so it cannot move. Set the dial reading on the rotary table to zero as all other holes are taken from this setting. Now with the 10mm slot drill, plunge cut through the block and 8mm in to the jig, (this is for the pivot pin), remove the 10mm slot drill and replace with a 12 mm end mill and mill through the block to the same depth. When machining the other expansion links, only take the 12mm cutter just through the block and you will not upset the size of locating hole for the next operation. Change to a 6.5mm drill and drill through the jig and tap M8. The reason for the recess in the jig and a tapped hole with a tight fitting bush in the hole and recess is to be able clamp it back in the same place for a later set up. Using a 14mm end mill open out the slot to 14mm change, to a 16mm end mill to finish the slot to size, taking the 13.7mm depth cut in one pass. Do not run the end mill back through the slot when you have finished the cut as it will more than likely take a cut on the way back and make the slot bigger than 16mm.

Change the cutter to a shell mill cutter. Machine off the top face 0.2mm, move the cutter over towards the centre of the rotary table so that the edge of the cutter is over the slot, and mill down another 5.5mm deeper (**photo 3**). Remove the expansion link from jig and repeat the same on the other small expansion link, also machine the larger expansion links - the larger expansion links have to be machined right and left hand.

Before starting to machine the larger expansion links, I sat a smaller expansion link on top of the larger link and scribed a line so I would know how long the slot has to be in the larger link. When milling the slot, make sure the finished 16mm slot is machined past that line but not so far as the boss on the end of the link. When machining the right and left hand links they will be over hanging the jig on ether side.

Turn a neat fitting 12mm diameter bush with an 8.1mm bore (to allow an M8 cap screw to pass through without interfering with the alignment of the bush) and push it into the 12mm hole in the expansion link and the jig. Turn to length so it is just under the slot enough so that you clamp the expansion link to the jig and not just the bush.

Before removing the last expansion link from the jig you can drill and ream the three rivet holes that hold the expansion links together (**photo 4**). Return the rotary table back to zero setting and move the milling table away from the

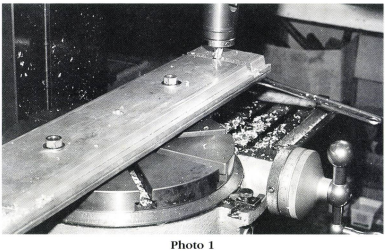


Photo 1

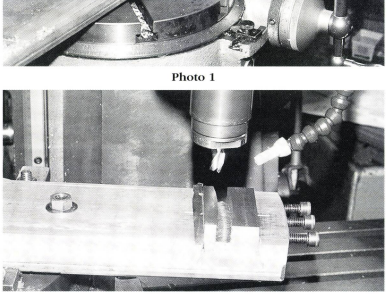


Photo 2

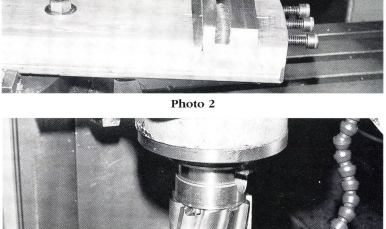


Photo 3

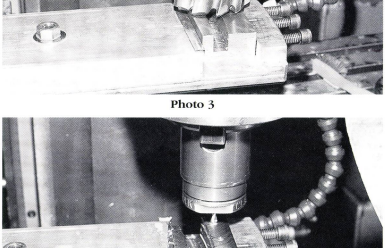


Photo 4

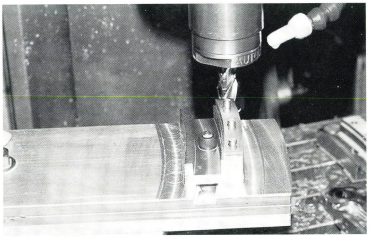


Photo 5

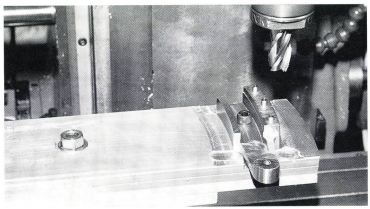


Photo 6

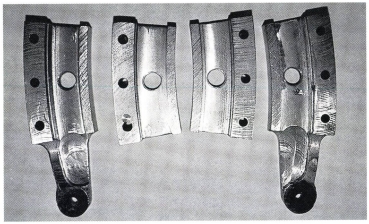


Photo 7 Photo: David Proctor

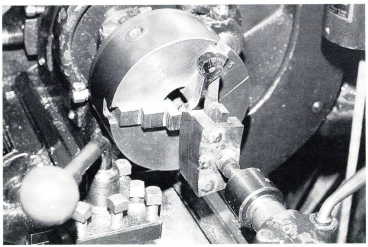


Photo 8

centre of the rotary table another 14.3mm to bring the centre of the holes to 250mm radius, centre drill and drill 5.9mm and ream 6mm. Rotate the rotary table 5°30" (5.5°) and drill and ream 6mm, then move the table the other side of centre 5°30" and drill and ream 6mm. The holes should be 24mm apart. Using the 12mm bush to locate the other expansion links repeat the process on all links. Reset the rotary table back to zero, rotate the jig 180° and drill and ream the same three holes in that end of the jig. Reset the milling table back to 235.7mm radius, drill and tap M8, change to a 12mm slot drill and counter bore to 8mm deep. You will use this end to machine the sides and ends of the expansion links.

Rotate the rotary table back to zero, lock the milling table and using the cross slide, set the table 66.15mm from centre, clamp in a large expansion link and centre drill and drill 5mm for M6. Do not tap the hole. Repeat for the other hand expansion link.

Reset the cross slide back to centre and lock. Put a 16mm slot drill in the milling head, move the milling table another 1.5mm away from centre and mill the step in the back of the slot in all links 5mm deep. Write that setting down as you will need it later. Make two mild steel disks 17.5mm diameter x 5mm thick with a 5mm bore — one will be used to mark the boss out on the end of the link, and both to file the boss concentric to the 5mm hole.

Rotate the rotary table 180°, and clamp the small expansion link to the jig using three 6mm pins in the rivet holes and the 12mm bush. Clamp the lot down with a 15.5mm diameter washer in the 16mm slot and a M8cap screw. With the 16mm milling cutter still set up, move the cross slide over 8mm off centre and rotate the rotary table 7°20" away from 180° and away from the 16mm cutter and machine the top face. Then rotate 7°20" past centre the opposite way and the cross slide 16mm the opposite way and machine the bottom face (**photo 5**). The finish length should be 59.5mm measuring from the centre of the width of the slot. Machine the other small expansion link the same. Clamp on one of the large expansion links and machine the top face as per the small links, rotate the table the other way ready to machine the bottom face but only machine to depth of 9mm from the top face. Move the cutter over to the inside face and machine down another 5mm, repeat on the other link. Bring the rotary table back to 180° and machine off the 9mm deep step on the tail of the expansion link, repeat for the other hand. To machine the web on the tail of the expansion link, mark out the boss on the tail of the link. With the 17.5mm diameter disc and 5mm pin in the tail pivot hole, scribe the outline of the boss on both links, so that you will not machine in to the boss. Set the 16mm cutter back on the 235.7mm radius and the cross slide on centre, move the cutter out another 1.5mm, machine down another 5mm so it is under the 16mm slot, then move the cutter out another 20mm and machine the full depth and the web is 4mm wide (**photo 6**). Repeat on the other link. Now move the cutter back to 227mm radius and the rotary table on 180° and lock the table. Using the cross slide, machine away the 4mm till it is level with the out side of the boss. Before removing link, machine 0.5mm off the boss face and repeat the operation on the other link. That finishes the milling of the expansion links (**photo 7**).

Turn the pivot pins, four off, from 16mm diameter BMS x 19mm long. Using a collet to hold the pins, face and centre drill one end, reverse and turn the other end to 12mm diameter, a press fit in the 12mm hole in the links. The length of the step is approximately 6mm and it should not protrude in to the 16mm slot. Press in the pins. If you are not happy with a press fit they can be silver soldered in — if so turn a small 45° chamfer on the end of the 12mm pin. Before assembling the expansion links, the three 6mm holes have to be counter sunk 3mm deep for riveting. I did not rivet mine, instead choosing to weld the three pins in, filling up the counter sunk with weld. Before welding clamp the two links together with the pins in place and then weld one side. Let it go cold and then weld the other side.

Put the assembled expansion link between centres in the lathe, face off the weld both sides and measure from the bottom of the slot to the edge, facing till it reads 5.5mm (**photos 8 & 9**). Machine both sides the same - it should read 38.1mm over all. Mark out the tail boss which is 0.8mm proud of the finish size the same as the boss on the pivot pins, turn the pins to 12mm diameter, and turn the 17.5mm diameter boss x 0.8mm deep, taking that cut out till it nearly touches the tail boss. Reverse in the lathe and machine the other side the same. Repeat the same process on the other expansion link. Using the filing buttons, file the 0.8mm deep boss to size (**photo 10**).

Die blocks

The last things to make on the milling machine using the same jig as for the expansion links, are the bronze die blocks 16mm wide x 9.5mm thick x 17.5mm long. Use one piece of 25mm diameter bronze x 100mm long, set it up in the four jaw chuck length ways, machine 7.7mm off the face. Reverse in the chuck and machine to 9.5mm thick so that you end up with apiece 25mm wide x 9.5mm thick x 100mm long. Drill two 6mm holes in the centre of the bar and 25mm ether side of centre, Rotate the milling jig around to 180° (the end with the 10mm slot), then set to 235.7mm radius and the cross slide to centre, rotate rotary table 6° drill 5mm and tap M6, then rotate back 12° and drill and tap the same. Make two 10mm diameter spacers x 8.1mm long with a 6mm hole to go in the slot. Clamp the bronze strip to the jig with the spacers under it and M6 cap screws in the 10mm slot. Using a 10mm end mill, move the milling table out to 249mm radius and machine the full 9.5mm depth, rotating the rotary table (**photo 11**). Then reset the radius to 248.7mm and take a slow cut to get a good finish, set the radius to 222.4mm and take a cut off the inside face, and finally, set to 222.7mm and take a slow cut to get a good finish. The width of the die block should be 16mm, a nice sliding fit, not a sloppy, in the expansion link slot. That is why the ends of the die blocks overhang the jig - to try the fit. If it is a little tight, they can be eased with a needle file when removed from the jig after they are drilled and reamed. Move the milling table back to 235.7mm radius, centre drill, and drill 7.9mm then ream 8mm. You will get four die blocks out of the bronze strip, one on each end and two in the centre. Mark out the four die blocks by hand leaving about 2mm between the two centre die blocks and in the centre of each drill and ream 8mm. Cut the die blocks to length, 17.5mm, drill a 1.5mm oil hole on the top of the die block and in to the 8mm hole, and counter sink the hole 1.5mm deep. The last thing to make is the two pivot pins. These are made from silver steel 8mm diameter x 27mm long. Do not drill the pin hole in the pins as they are drilled on assembly.

To be continued ...

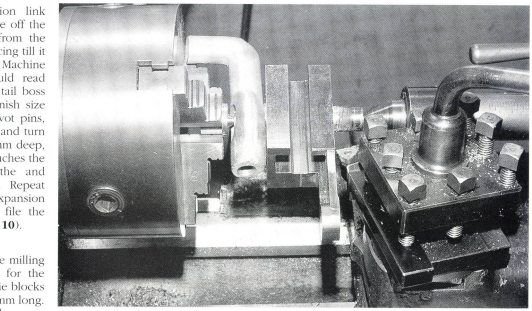


Photo 9

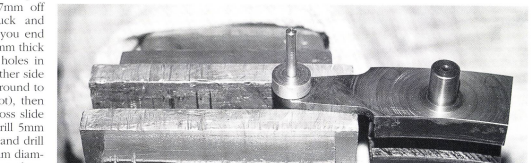


Photo 10

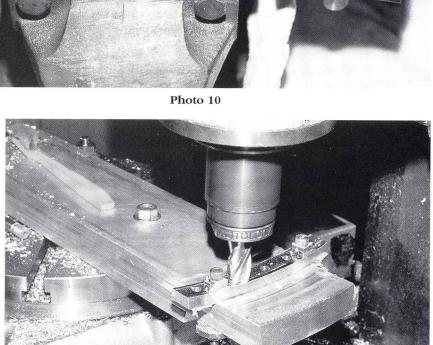
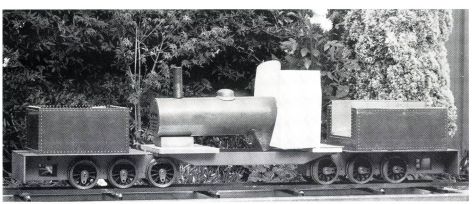


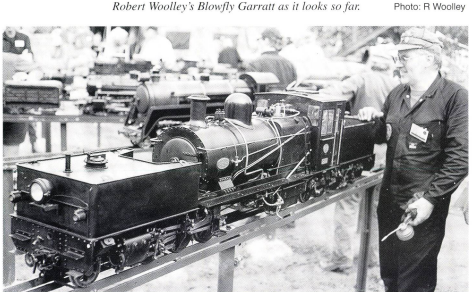
Photo 11

Garratt Gossip

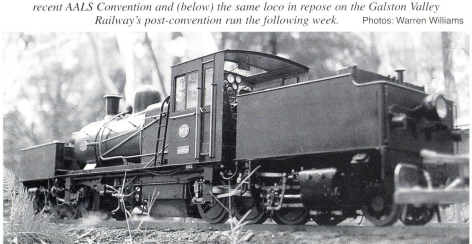
with John Cummings



Robert Woolley's Blowfly Garratt as it looks so far. Photo: R Woolley



Wayne Bradford (above) oils his father's Australian Portland Cement Garratt at the recent AALS Convention and (below) the same loco in repose on the Galston Valley Railway's post-convention run the following week. Photos: Warren Williams



This time I begin the column with a plea for help.

Early this year Ed Mol of Canberra received a phone call from Australian Portland Cement Co. It seems that some time ago they were approached by a person (it was not Keith Bradford of Adelaide) who wished to build a model of their 2-6-0+0-6-2 Beyer Garratt. Australian Portland Cement loaned this person their drawings but failed to ask for a name and address and now they would like their drawings returned. Does anyone know of the whereabouts of these drawings? If so, would you please contact Ed Mol through the AME office or better still, would the person who has these drawings return them to Australian Portland Cement in Geelong, Vic.

I have heard from Peter G Wardle that there are two AD60's being built in the UK, one by John May which was mentioned in AME issue 83 and the other by Colin Gaytor. Both models are 70% complete or thereabouts.

To our readers who have written, telephoned or spoken to me, especially at the convention, giving me snippets of information and encouragement, I say a hearty "thankyou".

One reader has asked if it would be possible to publish a list of names (no address) and what type of Garratt they are building. I can not see any problem with this request.

Blowfly Garratt

Late last year I received a call from Robert Woolley of Sydney, who is building a Blowfly Garratt in 5" gauge, and recently he sent me some photos of his work so far. This Blowfly Garratt is to be an 0-6-0+0-6-0 wheel arrangement.

Dimensions are:-

Overall length 2110 mm
Each drive unit length 597mm
Wheel spacing 152mm
Wheel dia. 114mm
Cylinder bore 39mm
Boiler dia. 173mm. (it is a short ened C38 class boiler)

ASG progress

During February I was in Canberra and while there I visited Ed Mol and Melanie Dennis to see how their Aust. Standard Garratts are progressing. I found them in the process of wheel turning, 32 driving wheels plus 24 bogie wheels. I suggested to Ed that maybe he could do these in his sleep, but he was not too keen to try this out in case he fell "whilst sleeping" into the lathe. These two Garratts are not exactly the same. Melanie's is an Emu Bay Railway version while Ed's is the Queensland Railway version. What will be interesting will be to see what sort of a load they will haul, individually or double headed.

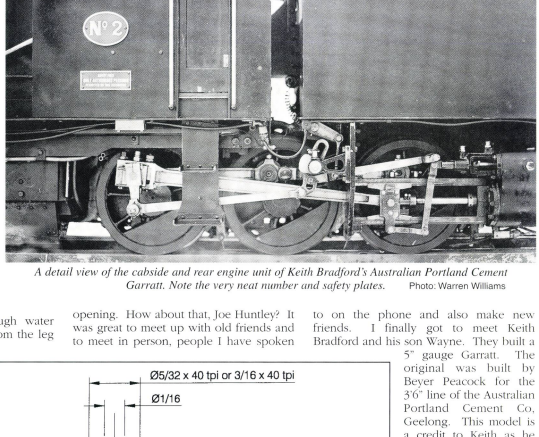
Cylinder drain cock

Last year Peter Wardle sent me a drawing of an automatic cylinder drain cock.

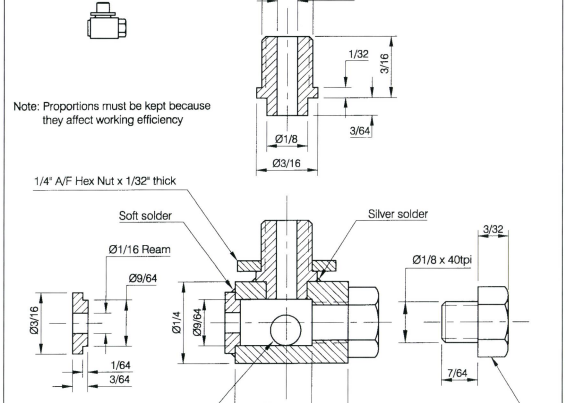
The vital part of this drain cock is a 3/32 dia. stainless steel ball and I have found a supplier in Sydney. The supplier is Australian Superior Ball Co, Suite 11, 265-271 Pennant Hills Rd. Thornleigh NSW 2120. Phone (02) 9980 5533, Fax (02) 9980 5599. Contact person is Mark Nicholas. Peter Wardle tells me that these drain cocks can be made larger BUT you must keep the same proportion for them to work successfully.

1999 Convention

I have just returned from the 2nd Wellington Boot Convention at Edgeworth alias the 43rd Annual Australian Association of Live Steamers Convention. Yeah! It bloody well rained again just like 1989, only not as heavy. I feel that the Lake Macquarie Live Steamers should redesign their convention badge, like a Wellington Boot wading through water and steam or smoke coming from the leg opening. How about that, Joe Huntley? It was great to meet up with old friends and to meet in person, people I have spoken to on the phone and also make new friends. I finally got to meet Keith Bradford and his son Wayne. They built a 5" gauge Garratt. The original was built by Beyer Peacock for the 3'6" line of the Australian Portland Cement Co, Geelong. This model is a credit to Keith as he had no drawings to work from. It was a case of taking photos of the loco (how many I don't know) and measuring up each individual full size component. It has a working Westinghouse air pump which supplies water to the boiler, head and marker lights, brakes are steam on the loco and vacuum for the train. To hear the exhaust beat with a small load behind whilst it's climbing Edgeworth (Huntley) Hill, which I am told is a 1 in 40 grade, brought back memories of hearing the AD60's climbing from Como to Sutherland in my younger days.



A detail view of the cabside and rear engine unit of Keith Bradford's Australian Portland Cement Garratt. Note the very neat number and safety plates. Photo: Warren Williams



Super-detailed AD60

On Easter Sunday I was taken into Lake Macquarie's workshop to view another 5" gauge AD 60 under construction which is being built by Andrew O'Donnell of the LMLS club, with assistance from his father, who is a pattern

maker by trade, and has a home foundry. I understand that this AD60 is Andrew's 2nd attempt at it. I must give him credit for the workmanship and detail that he has put into it so far — working mechanical lubricators, the crossheads, coupling rods, etc.

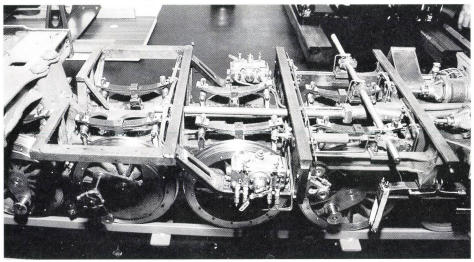
Another member of the LMLS, Greg Dawson had on display one engine unit of a Rhodesian Railways 20A class which was originally built in 2½" gauge but he is re-gauging it to 3½".

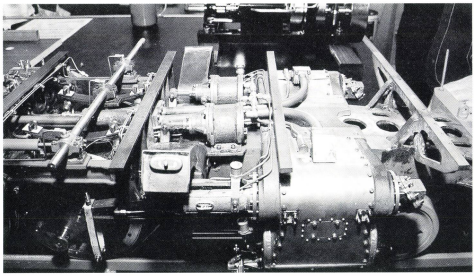
Recently while going through my book shelves, I found a book that I bought while in Perth last year, *70 years of Rails and Wire in Western Australia* by Jack Stanbridge. For the modeller who intends to build WA Garratts, there are quite a few photos of M and MSA Garratts which are ideal for detail work.

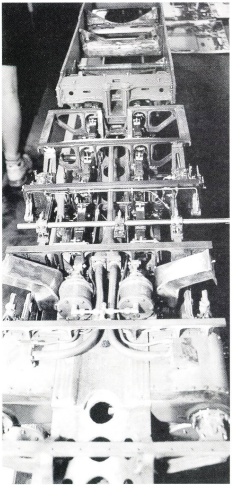
That is all for now. Until next time ...

Another view of Keith Bradford's Australian Portland Cement Garratt at the post-Convention run staged by the Hornsby Model Engineers. This time Wayne Bradford is hauling a long mixed train up the grade, over the impressive sandstone Gil's Viaduct towards the station, on the Galston Valley Railway. This setting somehow seems to really suit a Garratt type locomotive. Photo: Warren Williams

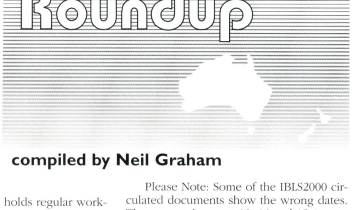
Left, below and below left: three views which show the amount of detail Andrew O'Donnell of Lake Macquarie is putting into his AD60 Garratt. It will be a very impressive model when completed. Photos: Peter Polson







Club Roundup



compiled by Neil Graham

Berry NSW

The Berry Railway holds regular working days every Tuesday and each Saturday prior to running days. Several Berry members went to the Newcastle convention. Hugh O'Dempsey's rail truck (featured earlier this year in AME) was very popular and Hugh was often seen "bailed up" to show and tell about his unusual vehicle..

Berry Railway Inc.
Location: *B35 Princes Highway, Berry*
Public Running: *None*

Bulla VIC

A great honour for one of our club stalwarts, Bill Belton who was awarded the Southern Federation (UK) trophy at the recent AALS Convention, in recognition for his contribution to the hobby.

The club has purchased five portable gazebos, which have been put to good use giving the public shade and protection. The Dutch Fair was an excellent public relations exercise for the club with much interest generated by the TLSS stand.

The carriages are steadily being upgraded and maintenance carried out. The Tuesday night team continues with the massive task of keeping the four locomotives available, the lure and incentive being Bob Morero's exotic biscuits and the late supper ale.

The club training scheme is having positive results with the standard of train control and train management improving all the time.

Tullamarine Live Steam Society
Location: *15 Green Street, Bulla*
Public Running: *1st & 3rd Sunday*

Burnaby BC

The second Annual Train Festival will be 14th and 15th August. The Auction 99 was a huge success, which made the treasurer very happy. The terms for Auction 2000 have already been set. The Tuesday Pizza and Work parties have resumed for the season with the focus on track and related site work.

The Mogul should be operational for opening day at Easter, the electric is coming along and the Northern has a long way to go before it is back to 100%. The 14 metre bridge constructed by BC Institute of Technology welding students has been delivered and placed on the abutments. The small tunnel portals are completed.

Please Note: Some of the IBLS2000 circulated documents show the wrong dates. The correct dates are 13, 14 and 15 August 2000.

British Columbia Soc. of Model Engineers
Location: *Rainbow Creek Station, 120 Nth Willingdon Ave, Burnaby BC Canada*
Public Running *???*

Christchurch NZ

The past year has been one of increasing membership. Sunday parties are becoming very popular with bookings up to December! The club is indebted to Jim Rosanowski for his effort over the years in arranging speakers on many and varied topics at club meetings.

The two club exhibitions have been a great success, with some new boats. The harbour gates have proven to be successful with no more large waves coming through from the IC boats.

The Rotary Day for underprivileged children was held and was very popular and well run.

At a recent Special Meeting of members, they adopted a policy to establish a 5" and 7¼" ground level railway. The Marylands Reserve sub-committee is continuing to report site progress back to the club for consideration.

Canterbury Society of Model & Exp. Engineers
Location: *Andrews Cresent, Christchurch*
Public Running: *1st and 3rd Sundays*

Echuca VIC

Members of the CVR have been busy with an ongoing major dual-gauge track upgrade for over twelve months now. A new mainline extension has increased the track length to around 600 metres. A new covered and paved station with island platform, coloured light signalling and moving frog points are all now in place.

Our major running day of the year is held in conjunction with the Steam, Horse & Vintage Rally, conducted by the Rotary Club of Echuca every Queens Birthday weekend.

Campaspe Valley Railway
Location: *Rotary Park (off Campaspe Esplanade), Echuca*
Public running: *1st Sunday (April - December incl.)*

Euroa VIC

We are currently undergoing major dual gauge track extension work. At the present time we run on 1500 feet of track, which offers a nice little run, but when the extension is completed it will give us about 3000 feet or a bit more. See *Coming Events* for details on our All Comers day in August.

Euroa Miniature Railway Inc.
Location: *off Turnbull via Hunter St, Euroa*
Public Running: *4th Sunday*

Eltham VIC

The Lions Club of Eltham has joined the DVR as a corporate member and they have been warmly welcomed. The Lions members have fitted in well with the railway operations.

All branches of the railway have been busy. Rolling stock under repair, worn rail replacement and a new double slip in the Diamond Valley yards. A new road between turntable and the double slip has been installed. The Sigs and Telegraph boys have been busy fitting quartz globes at Meadmore Junction and extra signal heads for indicators have been installed as well as burying their work.

Since 1961, when train operations began, the DVR has carried nearly two million passengers, and the mainline is now 1.8 km long! Eight locos are in running condition with a further six out for various reasons (two steamers down for boiler inspection).

Diamond Valley Railway Inc.
Location: *Lower Eltham Park, Main Road, Eltham*
Public Running: *Every Sunday*

Galston NSW

It has been decided that those foundation members who have unbroken membership will become Honorary Members. The portable track was put to good use at Fagan Park (Boat Pond) on Australia Day.

The GVR held its 3rd Scale/Timetable running event in March. Again it was a great success blessed with good attendance. At least ninety pieces of scale rolling stock were run. It is expected that this will become a regular biannual event.

The board is updating the operating code to incorporate amendments to some procedures. The matter of inviting Gauge 1 modellers to join the society has been reconsidered and there is now an invitation for those in NSW to join us.

Safety check rails have been installed in both the station roads to assist in preventing vehicle derailments while loading and unloading passengers. Two point motors of different parentage have been installed for evaluation. Brickwork on the unloading dock associated with the traction engine track is nearing completion.

The Inspecting Engineer has upgraded the train brake performance testing procedure and hardware. The local Mayor,

Stephen Pringle who has an ongoing interest in the club, on a recent visit offered council assistance if required. Two matters were raised and have been promptly attended to with the club's appreciation.

Hornsby Model Engineers Co-op Ltd
Location: *29 Mid Dural Road, Galston*
Public Running: *2nd Sunday*

Hamilton NZ

This club doesn't just wait for the passengers to turn up. They have about six sandwich boards located at strategic intersections on adjacent main road sites. They have also taken out block advertising in the local papers.

The club's 1.6km track has three tunnels, seven bridges and runs through native bush. The club has about 45 members and they have about 20 locomotives between them. On the March open weekend, over 5000 people visited.

Hamilton Model Engineers Inc.
Location: *Minogue Park, 24 Tui Ave, Hamilton*
Public Running: *Every Sunday*

Maidstone NZ

The graffiti artists have paid the club a visit, and directed their attentions to the station building. Several important running days have been lost this year due to inclement weather.

The club operated the railway as part of the "Round Table" community project initiative in mid March. Poor weather affected the attendance but there will be a repeat next year.

Maidstone Model Engineering Soc. Inc.
Location: *Maidstone Park, Upper Hutt*
Public Running: ***???***

Mangere NZ

During the summer months while the club's Dx was in shops for major service, the club had on roster a Da kindly loaned by Frank Pemberton. This locomotive did the public running duties until the Dx overhaul was completed and it was returned to service.

The Manukau club had a special run day for Kids with Disabilities on Waitangi Day last (6 February) This was a free rides all day event for all families with a disabled family member. Every child who rode was accompanied by a carer and this worked out very well. Several children showed more than the usual interest and they were in turn given a drive of the Ec electric loco under supervision. The MLS have been "warned" to expect a bigger turn out next year as the word of the good time had by all will spread!

The Bits and Pieces evenings are ever popular. One of the more unusual items was Dave Giles' Shay under construction. It is designed to be quickly gauge convertible from 7¼" to 7½" and vice versa. Murray Lane's 18 cylinder twin row aero engine (under construction) also commanded a lot of interest.

As mentioned earlier, the club NZR Dx has been overhauled and trials were conducted on 24 January. Its new hydrostatic transmission performed well, especially the dynamic braking effect when running downhill. The tests were undertaken with seven heavy ride cars with 36 adult passengers and a few children. After a return to workshops for final painting it was returned to service for the Waitangi Weekend mid-summer meet.

Manukau Live Steamers Inc.
Location: *Mangere Central Park, Robertson Road, Mangere*
Public Running: *Every Sunday*

Morphett Vale SA

Major modifications have been carried out on the ex DVR GM12 loco - changhes to traction controls, new relays fitted, self-lapping air brake, air reservoir, improved instrumentation, drive train and a remote fuel tank is fitted to a purpose-built driver riding truck to allow more fuel to be carried. The riding truck has also had a rebuild with new arch-bar bogies, each of which has a commercial brake cylinder acting on one axle. The truck is train lined with Ryco quick release fittings at each end. Bogie centres have ben moved further apart, allowing for a larger drop centre design which we are trialling. Loco and truck have been repainted to MVR yellow and blue. As the loco can easily exceed allowable speed, it has been fitted with a speedo/odometer.

The Per-Way dept has added another track to the new carriage shed, made possible with a LH switch made by John Wakefield. This gives 10 ground level storage tracks.

Morphett Vale Railway Inc.
Location: *Wilfred Taylor Reserve, Wheatsheaf Road, Morphett Vale*
Public Running: *2nd and 4th Sundays*

Moss Vale NSW

The club utilised the portable track at the recent Southern Highlands Weekend Exposition to promote the club and the hobby in the area. On Saturday, the Royal Scot powered train ran from 9.30 until 4.30pm. Sunday saw two locomotive failures (one a blown superheater just before whistle out and the other an embarrassed driver after attempting to light his loco up with water soaked charcoal rather than kero soaked). The trusty Royal Scot was again rostered on and the first train was away at 11am. The rest of the day was uneventful. Everyone worked well for a successful weekend.

Southern Highlands Model Engineers
Contact: *(02) 4868 2404*
Public Running: *???*

Nelson NZ

The scale boat club is proposing to build a wall so that they can have a weed free area to sail in. Work on the pond stormwater island has been finished. The old floodgates have been removed and new ones will be made and fitted.

The club has secured a generous contribution from the community trust. This will be put into flooring and carpeting for the new building. The outside of the new building has had its final colour coat of paint.

Nelson Society of Modellers Inc.
Location: *Adjacent Tahuanui Beach, Walkare St, Tahuanui*
Public Running: *Every Sunday afternoon*

Perth WA

If present members' commitment is any indication, then there is a good chance full operations for all the track will be resumed before the end of the year.

The inspection process for the club infrastructure and rolling stock is now under way.

Castledare Miniature Railways of WA Inc
Location: *rear of 100 Fern Road, Wilson*
Public Running: *1st Sunday*

Tamworth NSW

We have lost out on our original preferred site but are currently involved in positive discussions with the local council for another block of dirt. This one would give us around 1km of track with future potential for expansion when funds permit. We currently meet on the second Saturday, at various member's homes. Anyone wishing to attend should contact John Buckley on (02) 6765 3783

Tamworth & District Model Engineers
Location: *Contact John Buckley as above*
Meetings: *Second Saturday*

Warner QLD

35 club members recently had a day outing on the Mary Valley Heritage railway. Bob Evans did the first stint of driving. The restored C17 driven by Bribie club member Ron Harris (an ex NZR steam and diesel driver). The run back in two rail motors also had a local flavour with Warner member Clarrie Hough doing the driving.

1998 was a year of consolidation for the club. However, this didn't stop the work, as the roundhouse work is proceeding. Also steady progress is being made on the traverser. Not the be outdone, the elevated track devotees are doing a fine job with the new loading/unloading facilities. The powered points between the station and steaming bay are nearing completion. After a long design stage the signal lights are clear and bright and draw only a low current.

The club attended the AMRA model railway exhibition and much interest was forthcoming from the public, resulting in several new members joining up. Membership numbers remain strong despite the recent fee increases.

Qld Society of Model & Experimental Engineers Inc.
Location: *Warner Road, Warner*
Public Running: *None*

Whakatane NZ

Plans to build a narrow gauge railway have been lodged with the local council and the track has been surveyed and pegged. President Dave Fitton says support from the local community and business has been tremendous. Local contractors have provided material sponsorship and two local businesses have made premises available for club meetings. *(Courtesy CSMEE Canterbury Tales ... Ed).*

Eastern Bay of Plenty Model Engineering Society
Location: *Whakatane*
Public Running: *None*

Wodonga VIC

Our invitation run went really well and has to be counted as highly successful. We now get the fun of planning for next year's run (see below).

Work is still continuing on increasing the number of steaming bays and the length of our turntable out to 16 feet. Surveying has commenced for the extension into "Loo Loop", and hopefully trackwork will start soon. We are in the process of designing and building some 7¼" carriages to help with the busy months ahead.

Our club is finally getting its own home page on the Internet - www.cnl.com.au/users/lhme

Lake Hume Model Engineers Inc.
Location: *Diamond Park, Lincoln Causeway, Wodonga*
Public Running: *3rd Sunday*

Grandchester QLD

Public running day for the Grandchester Model Live Steam Association is the first Sunday of the month. We wish to advise all clubs and owners of 7¼" locomotives and rolling stock that the 7¼" track at Grandchester is suitable for fine scale only. Don't forget our 1st Birthday run (see below).

Grandchester Model Live Steam Assoc
Location: *2 Ipswich Road, Grandchester*
Public Running: *1st Sunday*

Farewell

We say goodbye and thankyou to these model engineers who have passed on:

John Green (Blue Mountains Railway Soc)
Shayle Solly (Nelson Soc. Modellers)
Tony Evans (Gisborne Vint. Mach. Soc)

and extend our condolences and best wishes to the family and friends they leave behind.

Coming Events

1 August
1st Birthday Run — Grandchester Qld
The GMLSAI invites you to their First Birthday run to be held at the club grounds at Grandchester.

21 August
Allcomers Day — Euroa Vic
The Miniature Rail & Engine Society is hosting a day for all to celebrate the completion of, and official opening the track extension. 22nd is normal run day, so guests welcome to stay over for Sunday. Victorian Side Valve Club (vintage car club) plan to be in attendance on Sunday. Contact Pres. Warren (03) 5784 1076 or Sec. George (03) 5795 2590.

11 to 12 September
AALS Spring Interclub run — St Mary's NSW
The Sydney Society of Model Engineers cordially invite you to attend the Spring interclub run at our track, 869 Luddenham Road, St Mary's. AALS meeting 3pm on 11th. Full camping facilities and refreshments. Running both days and night run Saturday. To help us cater properly for our visitors, could you advise if attending. All welcome, with or without models.

25 to 26 September
Canberra Invitation Run and Floriade — Canberra ACT

2 to 3 October
Central Coast Birthday Run — Gosford NSW
Due to the inclement weather in recent years, the club has voted to move its annual Birthday Run from September to October. Saturday 2nd will be public running (visitors not obliged) followed by night running and play day on Sunday. Contact (02) 4388 2416 if attending, especially night run, so catering can be arranged for the evening.

7 to 8 October
4th Old wares Expo — Warragul Vic
The West Gippsland Vehicle Restorers Club Inc are holding their 4th Old wares Expo at the Warragul Showgrounds. There will be displays of collectables, memorabilia, steam machines, household wares, historical photography, vintage vehicles, yesteryear fashion parade and much more. Contact Greig Wilson (03) 5623 1493

8 to 10 October
Hornsby MES Birthday Run — Galston NSW

10 to 11 October
Railway & Traction Engine weekend — Berry NSW
Our 7¼" Railway & Traction Engine weekend is on again. 2km of 7¼" gauge track and meandering pathways for traction engines, all in a beautiful rural setting, just 45 mins south of Wollongong. On site accomodation available. A great weekend for model engineers and families/friends. Not open to the public. Enquiries: Les Boyd (02) 4464 1304 or David Price (02) 4464 2196

22 to 25 October
Keirunga Park RR open weekend — Havelock North NZ

16 to 17 October
Spring Festival Invitation Run — Cobden Vic
A warm welcome is extended to all model engineers and other interested parties to join us in the annual Spring Festival, which is centred around Railway Park and our miniature railway. Lots of family activities, restaurant booked for Saturday evening. Hotel, backpacker and motel/caravan park accommodation. We can make reservations for you. Contact Jim Walsh (03) 5595 1251 or John Wiggins (03) 5595 1430.

22 to 25 October
New Plymouth SME open weekend — New Plymouth NZ

22 to 25 October
Hamilton ME Fun Weekend — Hamilton NZ

23 to 24 October
11th National Miniature Traction Engine Rally — Inverell NSW
This year the rally moves north again. Organiser Gordon Blake (02) 6722 4272

30 to 31 October
1999 Blowfly Rally — Orange NSW
5" gauge track, 12V & 240V power, compressed air and char available. Some loco storage and limited camping facilities.

6 to 7 November
Wagga Wagga Invitation Run — Wagga Wagga NSW
(see ad on page 63)

6 to 11 January, 2000
Model Engineers Convention — Blenheim NZ
Marlborough Associated Modellers are hosting this 2-yearly event. 2½", 3½" and 5" elevated and 5" and 7¼" ground level tracks. Boat pond with harbour complex and tethered car facilities. Further details later.

21 to 24 April
AALS 44th Convention — Warner Qld
QSMEE are hosting the year 2000 Convention. Preliminary information should be reaching clubs about now, and registration forms will be ready in October. Start planning now for the last convention of the millennium! For further info. contact Convention Secretary, Bob Campbell, PO Box 322, Everton Park 4053. Ph. (07) 3263 7462 (or Club Sec. Hugh Elsol (07) 3849 5573.

20 to 21 May
LHME Invitation Run — Wodonga Vic
Lake Hume Model Engineers invite you to Wodonga Creek Miniature Railway to join in their second annual invitation run. Further details later.

12 to 14 August 2000
IBLS Meet of the Millennium — Burnaby, B.C. Canada
For an action filled tour to this and other events, contact Barry Glover 31 Spinks Road, Corrimal NSW 2518, Fax (02) 4283 2331

Taper Turning by Geared Crossfeed Drive — part 2

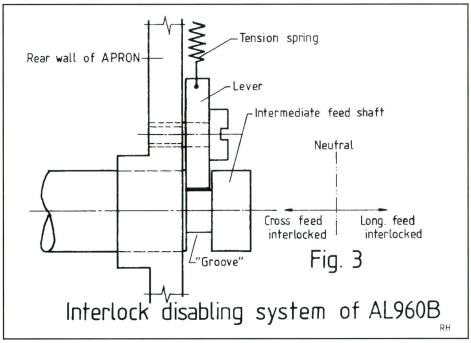
by Peter Dawes

Drawings for publication by Rod Heslehurst

The interlock control rod

See **Figures 5** and **6**. The rod is 3/16" MS threaded Whitworth at both ends. Make the two "end pieces" as per drawings. One is a 3/8" diameter x 1" long Whitworth "bolt". Very lightly skim the thread end of the bolt to square it and clean it up. Machine the head of the bolt down to 3/16" thick to reduce any temptation to put a big spanner on it to unscrew it completely out the front of the apron. That can't be done! It is an extra convenience to put a screw driver slot in the rear part of the shaft) with a 1/4" deep counterbore 0.403" diameter, which has a square clean bottom and a lightly chamfered front edge (1/32" max)

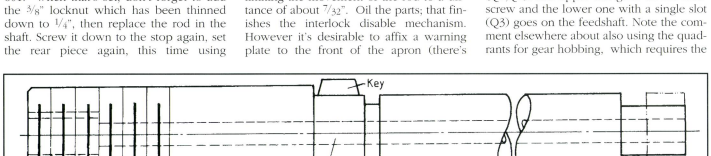
Both parts are tapped 3/16"W to screw onto the rod. Do all threading by guiding the taps and dies in the lathe in order to ensure straight true threads, or the parts are certain to bind. Assembly of the interlock disable mechanism can be done on the intermediate shaft before it is replaced, or probably better after it is replaced in the apron. Do a trial assembly to find the place to fix the bolt on the rod. Screw the bolt onto the rod. Insert the rod through the shaft. Screw the bolt down to the front stop. Screw the rear piece onto the rod so it just covers the end of the shaft. If there is too little or too much rod projecting, remove it and adjust the length in the bolt. When the positions are correct, remove the rod, clean it, reassemble in the same position and Loctite® it into the bolt with 601. When that's set, don't forget to add the 3/8" locknut which has been thinned down to 1/4", then replace the rod in the shaft. Screw it down to the stop again, set the rear piece again, this time using removable Nutlock 242 or 222®. Screw on the 3/16" locknut and tighten.

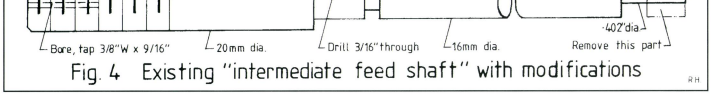


When correctly set, there is a 3/8" wide groove visible on the intermediate feed shaft in one position (the fully clockwise position of the rod, or "interlock disabled"). The groove will close to just over 3/16" at the other end of the travel (fully anticlockwise position or "interlock enabled"). The stops should therefore be limiting the movement of the rod to a distance of about 7/32". Oil the parts; that finishes the interlock disable mechanism. However it's desirable to affix a warning plate to the front of the apron (there's room above the halfnut lever. See photo and **Appendix 4** for suggestions for this.

The gear carrying "quadrants"

The third major stage, the quadrants, took three days to make. It's mainly a case of hacking out the slots and outlines. There are two of these, the upper one can have one slot (Q2) or optionally, two slots (Q1,Q2). The upper one goes on the leadscrew and the lower one with a single slot (Q3) goes on the feedshaft. Note the comment elsewhere about also using the quadrants for gear hobbing, which requires the





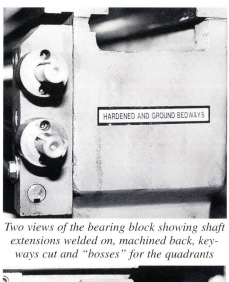
twin arm version of the upper quadrant (with both Q1 and Q2).

Make them out of 10mm or 3/8" plate. (**Figure 1**). I obtained two triangular scraps from an engineering works. They happened to be right angle triangles about 14" long with a small angle of 30°. I simply made the two arms down the longer sides of this triangle and put the pivot hole down at the acute angle. If your gears are 16 DP, 5" slots are plenty long enough. If using very big gears, the two longer ones can be 6". The slots should start close to the pivot hole, say about 1/4" away.

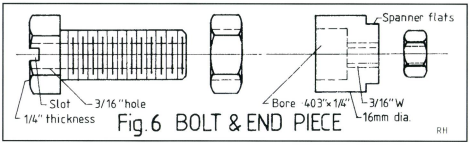
Notice in the photo that the gear assembly for a Morse No 3 uses only half of these slots, which were made 6" long in my original design. There is more than enough length. To cut the slots, start by marking them out accurately 3/8" wide. Drill 11/32" holes to define their ends. Saw into the apex of the slot to get access then bandsaw down each side of the slot, leaving the line.

When all cuts have been made, weld the access cut closed again. Put a piece of 1/32" thick steel in the gaps to fill them and clamp the sides together to hold them while welding. Firm clamping is essential for distortion-free welding. Having welded the cuts closed, grind the surplus metal off. Linish the whole piece to clean up but don't erase the marking out yet.

Clamp the quadrant on the table of the mill supported by a pair of 1/2" or 3/4" parallels, and with the slot lined up parallel with the longitudinal ways of the table, run



Two views of the bearing block showing shaft extensions welded on, machined back, keyways cut and "bosses" for the quadrants



a 3/8"slot drill or end mill down the opening to clean it out to size. You should be able to do this in a single pass. I always use Rocol Ultracut® applied with a camel hair brush while milling steel. It prolongs the life of the cutter and eases the cutting.

Now to make the hole for the clamp tube. Boring this hole is tedious. If the arms are less than 9" from the centre then the quadrant can be put on the faceplate of the AL960B and bored with the block taken out of the gap-bed. The maximum diameter in the gap of this lathe is 18". Four big cap screws hold the gap block in, and it is located by two roll-pins). Alternatively, the quadrant can be bored on the mill with a boring head. Either way, the best plan is to drill as big a hole as you can to start with, then bore it the rest of the way. So I used a 15/8" diameter hole saw on the mill. Note that you cannot use a 13/4" hole saw because these saws always cut up to 10 or 20 thou oversize on the hole.

To set up this job I first put a pointed rod in the drill chuck to locate the centre of the hole. Then I replaced the rod with the hole saw. I positioned the mill height on the column so that it would accommodate both drill chuck and boring head without requiring readjustment of height (because that would certainly upset the centring). I cut the hole in the plate with the saw running at 60 revs/min with heavy pressure. The saw must be lifted frequently and the teeth cleared by brushing lightly with the cutting oil brush. Put a drop or two of Rocol on with the brush at every pause. This makes a difference and it prolongs the life of the saw. It's slow work but not as slow as drilling a one inch hole and boring it out the rest of the way.

Finish bore the hole to 13/4" or to suit the tubing OD. Cut two pieces of 13/4" OD precision tube 1.3" long. Clean and square the ends to a length of 11/4" in the lathe. Place the quadrant on the welding table with what will be the LH side or "inner" face uppermost. Clamp the arms in two places supported on 1/4" high spacers (so the 1/4" projection of the tube will be to the right when the quadrant is in place on the lathe). The shorter arm, Q1, of the leadscrew quadrant is uppermost when they are installed. Put the tube into the hole and put a small bar of steel over it to clamp it firmly to the table also. This clamping is vital. Don't neglect it because it ensures the tube won't tilt during welding. If that were to happen the quadrant would be ruined.

If making both quadrants with a single arm, the holes are offset so that the two slots can come together parallel when both quadrants are in the horizontal position, where they will be about 13/8" apart. The tube must be orientated in the quadrant arm so that the 1/4" projection is always to the right hand side. (see drawing and photos). Now weld the tube into the plate all round. Turn it over and weld the other side. Clean up the weld with the angle grinder. If the bore of the tube is distorted by the welding and becomes uneven or not square with the arm, it will be necessary to skim it out lightly on the mill or lathe to clean it up. It shouldn't need this. If this makes it oversize, the boss will have to be made slightly larger in diameter to match. That's why we make the bosses later.

Finish the rim of the plate that encircles the tube to about 3/16" wide for about half of its circumference, as per the drawings. Because the shafts are only 2.15" apart the two quadrants must not exceed a radius of 11/16" where they are adjacent or they wont fit. The top quadrant should be able to rotate from the horizontal to about 60 degrees upwards or more without fouling the hub of Q3.

Make two lugs for clamping the tube onto the boss using 3/4" x 3/16" bar or a near size in metric. Notch the pieces to fit over the quadrant plate rim, fitting them approximately to the outer side of the tube. The edges of the lugs in contact with the tube have to be bevelled about 15° to roughly follow the outline of the tube. Position the lugs so the quadrants will be able to swing widely apart (see GA drawing). Weld the lugs in place with a temporary 3/16" spacer between them and clamped temporarily to the tube. The important weld is the one down the length on the outside because this takes all the strain when the tube is clamped to the boss. Also weld the ends of the lugs to the tube ends. Clean up all welds with the angle grinder and file.

Drill the lugs for a pair of 1" x 3/16"W cap screws. Drill clearance holes (7/32") in what will be the upper lug, and drill the lower lug #26 for tapping 3/16"W. Cut the tube apart between the lugs to split it. The cut should be wide enough that there is still a gap when it is clamped tight around the boss. This can be done readily with a hacksaw. Repeat for the second quadrant. After cleaning them up and painting them, the gear frames or quadrants, are complete.

The 'bosses' to go on the shaft-supporting "block"

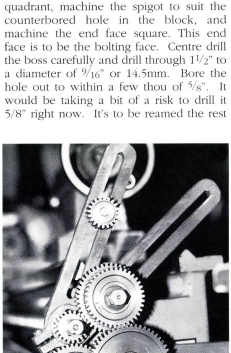
These took an afternoon to make. First clean up the right hand face of the "block" on the linisher to remove any paint or projections and counterbore the holes for the bosses. The block should already be square in cross-section. There are two ways it can be counterbored. One is on the mill table with the boring head. The other is to use the 4-jaw independent chuck and bore it in the lathe. Both methods have their merits. All we are concerned with is to ensure that the counterbore is concentric with the existing 5/8" bearing hole.

Assuming it's to be done on the mill - mount the block on the mill table, lined up longitudinally by means of a bar in the table slot. Centre the leadscrew shaft hole under the boring head first. Counterbore the 5/8" shaft hole out to 13/16" diameter for a depth of about 1/4". It is to be a close fit on the spigot of the boss so make the spigot to exact size after boring the hole.

Each boss (**Figure 6**) should be machined as far as possible in a single holding in the chuck. The best material to use and the easiest to work, is undoubtedly Flow-cast iron. Start by doing the OD, then the spigot, and then boring the hole. Machine the OD to suit the hole in the quadrant, machine the spigot to suit the counterbored hole in the block, and machine the end face square. This end face is to be the bolting face. Centre drill the boss carefully and drill through 1 1/2" to a diameter of 9/16" or 14.5mm. Bore the hole out to within a few thou of 5/8". It would be taking a bit of a risk to drill it 5/8" right now. It's to be reamed the rest of the way when it's finally assembled. With a goose neck parting tool, part it off to a length of 1 1/2" (ie. total length 1 1/2" with spigot) and then turn the boss end-for-end in the chuck. Clean this end up flat and square. Score a circle on this end midway between the periphery of the 5/8" hole and the OD of the boss. Scribe lines at 3 positions 90° apart, that is if you can do this in the lathe. This indexing is for the three fixing holes to be drilled in the boss. Drill all three fixing holes 3/16" — that is, for two capscrews at 12 o'clock and 6 o'clock, and for a roll-pin at 3 o'clock.

Drill the holes the full length of the block and square to the end face. Now open out the two diametral holes to 7/32" for clearance for the capscrews and for the counterboring drill spigot. Using a special 3/16" capscrew counterbore, drill down to half way through the block for 1" capscrews or otherwise to a depth to suit the length of the screws. Temporarily fit the boss onto the block on the drill table and clamp it to prevent movement. With a 3/16" drill, drill through the boss at the 3 o'clock point and on into the block to a depth of 1/2" in the block for the roll-pin. Remove the boss, check the depth of the hole and if OK drive a 1" x 3/16" roll-pin into the block. Replace the two parts now pressed together and pinned, on the drill table. Spot into the block with the same sized clearance drill (7/32") through the holes in the boss to start the tapping drill, and then drill the two screw holes into the block with a #26 drill as deep as needed for tapping 5/16"W (say about 5/8" deep). Repeat for the second boss.

Bolt bosses to the block with suitable capscrews (1" or 1 1/4"). Ream through block and bosses 5/8" to ensure alignment. This completes the bosses so the block can now be screwed back onto the lathe bed. The quadrants can now be tried in place. Twin capscrews will hold them firmly in position without requiring staying.



Gear train set up for a Morse No.2 taper. Note spare half length shaft with idler on a quadrant, but not playing a part. Note how little the space the whole train takes up on quadrants and how close bottom RH gear is to the feedshaft. The computer program TPRGEARS proved this combination could be assembled without physical testing.

The gears — some hints, tips & traps on gear cutting

(a) When changing gear cutters, don't assume that they are the same thickness — and if it turns out they're not, it becomes necessary to reset the cutter height! This is where the height gauge method shows its advantages. The setting is the same as it was at the beginning, so if the gauge hasn't been altered since, it can be used to very quickly reset the cutter height.

(b) While turning the index pin of the dividing head, watch it all the while. It's too easy to hit the sectors and shift them slightly. If that happens and you don't detect it immediately, you can kiss that gear goodbye.

(c) Never index when tired, when not able to concentrate, or when a member of the family is likely to interrupt with some earth-shattering piece of information or with an urgent job.

(d) Complete a gear once you start it. Don't start cutting teeth if you think you might not be able to complete it at the one sitting.

(e) If making a batch of various size gears, and if it is easier to change a cutter than to change an index plate (as in my case with the cutter on an arbor in a R8 collet), work out all the indexing calculations at the start and do the cutting in the order that minimises plate changes — or vice versa if that is appropriate for you.

(f) Easily the best material to work with is Flow-cast iron (Blackwoods sell 4" diameter in a minimum length of 18" so pool your needs with other club members. 18" of 3" dia. currently costs about $65). It doesn't need a coolant and it cuts like cheese. Slice discs up with the bandsaw from stock bars of appropriate diameter. Hubs aren't needed for the taper turning attachment. Cast iron isn't cheap but it saves so much time and effort that it's well worth it. In any case, the difference in cost from free cutting steel is negligible.

(g) If a cut is producing chattering it means the mandrel is not rigid enough for the depth of cut undertaken. Stiffen the mandrel rather than reduce the cut in the interests of saving time and in reducing the potential for making indexing errors.

(h) My current estimate of the best all round set of gears for .01% accuracy is the following twenty. (Note that there are two each of 20, 30 and 40 teeth. It is impossible to specify an "ideal" universal set because the calculation must include the lathe constant, an unknown quantity for lathes other than the AL960B) 18,19,20,20,21,22,23,24,25,30,30,35,40,40,45,50,50,55,60. They can all be made from stock sizes of cast iron, 1 1/2", 2",3" and 4". Or free cutting steel can be used up to 1 1/2" diameter if preferred. I used CI for all of them since there is no significant load and speeds are very low.

(i) A cutting compound such as soluble oil works with cast iron not so much as a cutting lubricant but as a coolant and it is desirable if working the tool hard near maximum capacity. If the tool is running lightly loaded as it is with most gear cutting, it's not worth the hassles of running the pump and having to clean up afterwards. But a coolant should be used if cutting steel.

(j) A very useful accessory when gear cutting is a small cheap two-leg puller. Certainly tight gears can be knocked off the mandrel with a hammer, but this has the nasty habit of shifting the very thing you don't want moved rather than the gear that you do, and of bruising the teeth. You can pull them off by hand too, but sooner or later you will impale the back of your hand on the tailstock centre. If they can be removed by hand easily, they are arguably too loose. It's always safest and best to use a puller

To be continued ...

(Note: you really should wait for the conclusion of this article before you try to use this method of taper turning ... Ed)

Letter Box

Boiler feed water

Sir,

I would like to congratulate Ted (*Boiler Feed Water* issue 83) on raising an issue that I believe desperately needs some attention.

I would like to point out the some of the dangers and problems that are likely to be encountered with Ted's recommendations, regarding the pH level of boiler water. Firstly, high pH levels (over 10.8) causes "caustic embrittlement" of steel, when used in a boiler. Though, according to the books that I have read, a pH of 10.5 is considered "ideal". This "ideal state" provides maximum corrosion protection to the steel, with only minor caustic embrittlement. Continuously supplying a boiler with feed water with a high pH will cause the total pH in the boiler to rise as the water is fed in. If a continuous blow down is employed, as per stationary boilers, and a much lower pH feed water is given to the boiler (say pH of 8) then it will stay constant. Very little in the way of dissolved solids, this includes caustic, leaves the boiler through the steam, unless through priming. Only through "blow down" can these particles be eliminated. High pH levels are also directly related to extreme frothing and consequentially priming. Water carry over, or priming, can be especially bad in model boilers, due to the small distance from the water level to the steam take off. Only the large narrow gauge loco's will escape this problem, which can lead to corrosion within other parts of the engine, e.g. cylinders, pipework, etc.

Secondly, the high pH causes the suspended solids to precipitate out of the boiler water (this only happens at raised temperatures) and the tannin holds the precipitated solids as a soft sludge that can be blown out with the blow down, instead of forming on the "hot areas" (tubes and fire box) as scale. Without any treatment (tannin, caustic, etc.) in the boiler water at all, the suspended solids will precipitate out of the water at, and on the heating elements of the boiler, forming a hard scale to be deposited on these areas. The majority of suspended solids will "start" to precipitate as the temperature is elevated above 100°C. The precipitation rate increases as the temperature is increased. It may be noticed when both tannin and a raised pH are used in a boiler, that if after running for a while the engine is allowed to stand for a short period, the water in the gauge glass will clear from the top down. This is the settling out, of the tannin enshrouded solids, to form the sludge at the bottom of the boiler. If after half an hour the boiler is given a blow down, it may be clearly seen that the water initially blown out will be a very dark colour. This is the sludge being removed from the boiler.

Phillip Smith
Western Australia

Metrication

Sir,

Being somewhat over 50 I guess that I well and truly fall into the category of "Imperial Apprenticeship Person". But I must say that for quite a few years now I have been thinking in metric, it is so simple to use when one gets a grasp of a few simple as close as damit conversions.

An inch is 25mm and 1/64th of an inch. So 2 inches is just over 50mm, 3 inches just over 75mm and so on. Sure it gets a little more inaccurate as the size increases but 4 inches is 100mm and 1/16 of an inch. That should enable anybody to visualise his 88.5mm crank pin. If only the inventor of the metric system had made 25mm to an inch instead of 25.4mm.

As a foot is 304.8mm, use 300 for visualising purposes. Actually some years ago in England I bought some timber and was told their unit of measurement was the metric foot. Therefore I had to be careful as my ten foot lengths I required would only be approximately 9ft $10^{1}/_{4}$ inches. A metric foot is only 300mm long.

When it's time for that finishing cut to get a 'couple of thou' interference, no trouble. 1mm is almost 40 thou. Therefore $^{1}/_{2}$mm is 20 thou, $^{1}/_{4}$mm is 10thou. 0.1mm is 4 thou, so the couple of thou interference is 0.05mm. It is therefore not to difficult to apply these equivalents to the dials on the old imperial machines if working in metric or to the dials of your new Chinese machine if working in imperial.

Don't knock the calculator, I can remember as an apprentice having to calculate such things as $3^{47}/_{64}$" x sin 33 deg 25min. using logarithms and trig tables and checking with a slide rule after doing the addition twice.

Give me metric any day.

Sam Alcock.
Queensland.

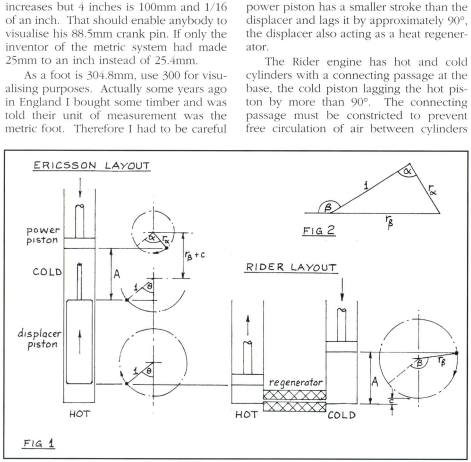
Ericsson and Rider hot air engines

Sir,

The cylinders of Ericsson and Rider hot air engines are shown schematically in Fig 1. The objective is to determine the stroke and piston lag required for a Rider engine to have the same volumes of hot and cold air during a cycle as a typical Ericsson engine.

The Ericsson engine has a single cylinder with a displacer piston and a power piston, the base of the cylinder being heated and the upper part, between displacer and power piston, being cooled. The power piston has a smaller stroke than the displacer and lags it by approximately 90°, the displacer also acting as a heat regenerator.

The Rider engine has hot and cold cylinders with a connecting passage at the base, the cold piston lagging the hot piston by more than 90°. The connecting passage must be constricted to prevent free circulation of air between cylinders



and may also contain material to act as a regenerator.

In a typical Ericsson engine:

Power piston lag $\alpha = 90°$

Power half stroke $r_\alpha = 1/1.6 = 0.625$

For the Rider engine to have the same hot and cold air volumes throughout a cycle, the lag and half stroke of the cold piston are given by the triangle in Fig 2.

Cold piston lag $\beta = 180° - \text{atan}(r_\alpha) = 148°$

Cold half stroke $r_\beta = \sqrt{(1+r_\alpha^2)} = 1.18$

These results can be verified by checking dimension A in Fig 1 at any value of θ. For example, letting θ equal 50°, in the Ericsson:

$A = c + r_\beta + \cos\theta - r_\alpha\cos(\alpha-\theta) = c + 1.34$

And in the Rider:

$A = c + r_\beta - r_\beta\cos(\beta-\theta) = c + 1.34$

where c = clearance space

As A did not change, the β and r_β values are correct.

The space occupied by the displacer piston rod was neglected, but could be taken into account by reducing the Rider cold stroke by the same fraction as the Ericsson cylinder cross section was reduced.

John Whatham

New South Wales

Points on timber sleepers

Sir,

Kevin Bruderlin asked the question in his article 'Back on Track' (AME May-June 1999): "In full-sized work, with all the track upgrading and concrete sleepers now in use, timber sleepers are still used at the points ... Why?"

I checked with my friend Roger Wyatt, a civil engineer who is a track engineering consultant, and found the answer was more complex than I had thought. Roger said the main problem with using concrete bearers in turnouts relates to cost. The cheaper option is to cast into the concrete - in fixed positions - rail-fixing shoulders (e.g. Pandrol) that hold the rail. However, to do that you need a standardized design so that the location of the shoulders is precisely known. Otherwise, a detailed, one-off design has to be prepared. You also need good control of tolerances. For a non-standardized design, or one that allows some variation in geometry when assembling the turnout, an alternative is to cast in ferrules that take screw spikes. In turn, the screw spikes hold plates on which Pandrol shoulders are welded after assembly. That too involves extra cost. With timber bearers, the holes are bored in place during the assembly of the turnout.

A second factor is that track-related derailments tend to occur at or near turnouts. Timber sleepers are less prone to damage in a derailment than concrete. If damaged, timber sleepers can easily be slid out and replaced by a sleeper that's slid in and bored in place. To remove a concrete sleeper, however, you have to lift the track so it clears the fastenings when you slide it out. The replacement bearer has to be made specifically to replace the damaged one.

Despite this, more concrete turnouts are appearing, especially to standardized designs on primary main-lines.

Kevin also said: "The tracks of the high-speed French trains appear to have a concrete sleeper at each end of a steel tiebar (as in figure 1 on page 36). Is this for flexibility?"

The main advantage of twin-block sleepers used on the TGV lines is that there no chance of cracking resulting from "centre binding" - the tendency for the sleeper to see-saw about a "pivot" of ballast in the middle, which has not been compacted in the same way as ballast under the rails. Also, there is more resistance to lateral displacement because there are two end faces per sleeper. However, opponents of twin-block sleepers hold concerns about their ability to maintain gauge.

The TGV track is built to specifications similar to those of the Pilbara iron ore railroads, with very heavy rails. It is maintained and aligned to an exceptionally high standard - for example, the maximum permitted vertical mis-alignment is 0.3 mm (the thickness of a business card) per 1.8 metres. Furthermore, the axle loads are light. Despite all this, there is an element of controlled flexibility in TGV tracks, just as there is in conventional tracks. Nevertheless, at higher speeds on conventional lines monoblock concrete sleepers give a harsher ride - partly because of their higher mass - than twin-block sleepers, which in turn are harsher than timber.

This takes me to one of Kevin's main themes with miniature track - that we should utilize the cushioning effect of timber sleepers and ballast. Every time I drive at my club tracks at Wagga Wagga and Berry, I notice the considerable difference between the lengths laid straight on to concrete and the lengths laid on to ballast. And I well remember driving on beautifully ballasted track at Rosewothy a few years ago - the difference was amazing, especially after a few hours of running! When full-size track has to be laid on slab concrete, it's laid on resilient pads. Yet again, we can remind ourselves that the professionals who build the full-size railways knew what they were doing!

Clive Huggan

Canberra

422 class component leads

Sir,

It may be of interest to those presently constructing or contemplating construction of the 422 class diesel outline locomotive, serialised in AME over the past few years, that some difficulty may be experienced in locating a source of supply for some of the electronic componentry.

Through the assistance of Talking Electronics in Melbourne and others, two components in particular may be purchased as follows:

1N3493R diode, 30Amp, 200V (2 per loco) available from Rockby Electronics P/L, 261 Huntingdale Rd, Huntingdale 3166. Ph. (03)9562 8559.

(I believe they may be available from Oatley Electronics in Sydney as well)

Microswitch, Burgess type with roller, 5Amp (2 per loco and fitted in Operator's Controller) available from:

Radio Parts Group, 1097 Dandenong Rd, East Malvern Vic 3148. Ph. (03)9571 8122

Talking Electronics, 35 Rosewarne Ave, Cheltenham Vic 3192, (03)9584 2386 were very helpful in not only sourcing the diodes for me but soldered-up the sound generator kit for me for a nominal charge. May hands aren't as steady as they once were.

Be aware that you can purchase **HELLA Relays**, type 3078, 30Amp already fitted with diode protection. Again it's very fiddly trying to solder your diodes into the 4 required relays, so buy them already done.

John Riters

Victoria

(A subsequent note from John advised that the day after he sent this letter in, he received advice from another source who had located a supply of the 1N3493R diodes in the US, at much the same price as they can be obtained here plus freight which is $10 for 20. This source specialises in sourcing hard-to-get and unusual items of an electronic nature. He is Des Kenneavy, Speedbird International, 8 Melrose Ave, Coldstream Vic 3770. Ph. (03)9739 1333. This is starting to look a bit like an ads page, but these contacts could be very useful for anyone starting out on this project. Thanks John ... Ed.)

Balancing radial engines

Sir,

I would appreciate guidance on the principle involved in the balancing of the crankshaft of a 9 cylinder radial engine. I have read Mr L C Mason's book *Model 4-Stroke Petrol Engines* in wich he discusses the balancing of a single cylinder crankshaft at some length, and wonder if one should consider a multi-cylinder radial engine as a succession of single cylinder engines.

Bart Borghesi

Victoria

(If anyone is able to help Bart with this one, it would be much appreciated ... Ed.)

Garratts

Sir,

I have read with interest an article by Bob Brown titled 'A Lifetime Modelling Garratts' published in AME at pp 9-12 of the May-June 1999 issue.

On the Garratt issue, I had published an article titled *New Zealand G class Garratt*, in AME at p 44 of the July-August 1993 issue. I have another image, to accompany the previous image, of the 3.5"

Eight cylinder Garratts			
Tasmania (TGR) (1912)	Beyer P.C/No 5523-5524	M1-M2	4-4-2+2-4-4 conjugated valve gear
Six cylinder Garratts			
New Zealand (NZR)(1928)	Beyer P.C/No 6484-6486	G98-100	4-6-2+2-6-4
United Kingdom (LNER)(1925)	Beyer P.C/No 6209	U1 2395	2-8-0+0-8-2 both have Walschaert-Gresley/Holcroft conj. gear
Compound Garratts (4 cyl)			
Burma Railways (1927)	Beyer P.C/No 6354 (1927)	GA11 208	2-8-0+0-8-2 Compnd. cyls. front chassis
Tasmania (1909) (NEDundas Tramway)	Beyer P.C/No 5292-5293	K1-K2	0-4-0+0-4-0 Orig. cyls. inner end chassis

model by the late Basil Wilson. This is reproduced above by permission by Mr E J McClare.

Most 1:1 Garratts were built to the standard simple expansion format with four cylinders at the outer ends of each pair of chassis. However there were a number of Garratts that were built to different formats. These were either, compound expansion, eight cylinder, or six cylinder, formats. (see table above)

A question is perhaps raised by the above data. Were the Tasmanian K class Garratts the only examples that can be classified as 'Garratts'. The chassis format of all the other examples was the reverse of this class. Should all other examples of this articulated format be classified as 'Garratt Derivatives'?

Perhaps the original Patent Specifications might detail whether the intention for this format, classified as a 'Garratt', was only ever to have cylinders at the inner end of each chassis. Do subsequent Patent Specifications ever mention or detail this issue?

James Tennant
Canberra

Welding boilers

Sir,

Bevan Wilson (Letterbox May-June 1999) must be a fairly experienced welder to be contemplating a boiler from medium to high tensile steel, especially using MIG welding.

Using our AMBSC as a guide, I can't see the benefit to Mr Wilson in using other materials than specified in the Code unless he wants to experiment, but that is up to him. Unless you have access to preheating, post heating and normalising facilities, you can get in trouble using some of the materials suggested by Mr Wilson. Considering some materials that come to mind, with some of these steels it becomes necessary to have an analysis done of the elements which make up the steel to be able to select the correct consumables, such as welding electrodes or wire, and if using TIG or MIG, availability of different gasses to obtain the correct shielding gas mixture. Various amounts of elements such as carbon, manganese, chrome, silicon, phosphorus, nickel, molybdenum and copper are added to these materials to enhance their usability in making analysis necessary, and requiring greater skills in welders to select correct consumables as well as the correct process and method.

In case Mr Wilson hasn't done so, I suggest he tries to obtain a Welding Procedure Manual from one of the welding companies like Lincoln, WIA or BOC, as some of these give the analysis of various metals as well as best welding methods and procedure. A further suggestion to Mr Wilson, if he hasn't already done so and one is available, is to take an advanced welding course at TAFE in welding special materials.

In no way is it suggested that this doesn't happen with other types of welding methods, but how many of us, and how often have quite a few observed supposedly good welders using MIG process put down unsound welds? Looks good, but given a whack with a hammer or pressed to straighten, it breaks away from the parent metal, not through the weld throat, but pulls away from the parent metal like pulling sticky tape off a parcel. In no way am I suggesting that Mr Wilson is a welder of this quality, but this happens and I shudder when I think of MIG welding on our boilers, but prefer TIG as a root run and finished with stick electric welding or submerged arc.

I hope this letter is receives as intended, i.e. constructively. In no way is it intended to put a damper on those who want to have a go and experiment, but be careful and remember, AMBSC is not as complicated as it reads, and allows those who would like to be a bit different to have a go.

Kevin Bruderlin
New South Wales

A job well done

Sir,

Whilst talking by telephone recently to a professional photographer friend in Queensland, he told me of a visit to a local public steam running day at a model engineering society. He was very impressed with the standard of craft skill in the making and finish of the engines running and on display. Although not an engineer, his professional eye recognised the pride of craftsmanship displayed. Exquisite was the adjective he used. He mentioned further that most of the drivers/operators were 'mature age" men, some quite elderly.

After the call, I fell to thinking of my apprenticeship in the Victorian Railways during the early 1930s. I worked under a number of tradesmen but the one I remember was Andy Heinz. Not all tradesmen would bother with the "kids' but Andy did. I realise now that Andy, in his time, would have received his training under craftsmen who bothered with "kids", being at that time the only way tradesmen learnt their trade.

Andy insisted on the highest standard of work from his apprentices, saying that quality was first, speed came with practice. He drummed into us how a craftsman should take care of tools and use them properly. Andy's apprentices by their third year, were often as good as full tradesmen.

I still remember two object lessons in particular. I was tightening a vice, with a piece of pipe on the vice handle to get more leverage, when Andy spotted me - I can still hear the roar he let out. I didn't understand what he said but he likely lapsed into oaths in his mother's tongue. The other lesson was a job I knew I had flummed. Nothing was said but he looked at the job, then at me, then we both looked at the job, and he turned and flung it down the length of a long workshop and finally said, "Do it again and properly".

Where am I heading with this reminiscence? I reckon that many of the elderly owner/builders my friend saw at the steam running day were trained by craftsmen like Andy, and they still take pride in a job well done.

Stan Allison
Victoria

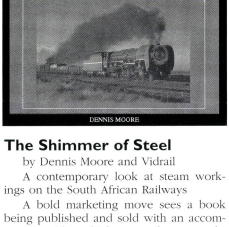
Letterbox Contributions

You are welcome to send letters by mail to:
PO Box 21, Higgins, ACT, 2615 or
fax to: (02) 6254 1641 or
e-mail to: **ame@dynamite.com.au**

As far as possible, AME is an open forum for all members of our hobby. Therefore, all expressions of fact or opinion as long as they are not libellous will be considered for publication.

Please **type or clearly print** your letters, as script is often difficult to interpret. Due to popularity of Letter Box and limited space, letters of **400 words or less** will have a better chance of being published.

Product Reviews



The Shimmer of Steel

by Dennis Moore and Vidrail

A contemporary look at steam workings on the South African Railways

A bold marketing move sees a book being published and sold with an accompanying video which covers the same subject matter as the book.

The Book

Using the same large horizontal format as his previous book *The Sunset of Steam*, it sits well with and is a worthy successor.

160 pages of all colour photographs fill nearly every page of this publication. The book is hardbound with a heavy gloss paper cover. All the inner pages are of a heavy semi gloss and dense high quality paper. The cover features debatably the world's best known modern locomotive, the class 26 *Red Devil*, in full flight at the head of a freight.

Inside, the author introduces the book by giving a precis of the very recent (1990s) history of steam locomotive workings and the preservation movement in South Africa. The book has seven chapters or sections. These are thematic rather than the more usual chronological or totally geographical. Some titles are *The Magic Hours* (covering dawn and dusk), *Mountain Vistas* (self explanatory) and *Precious Metals* (mining companies' steam operations) to name but three.

There is no doubt that Moore knows how to take a good photo. He doesn't just take photos of locomotives and trains. He takes photos of scenes. They just happen to have trains in them, but there is no mistaking the intention and the effect. The train is still very much the subject. Some of his compositions are really outstanding. He does seem to have the knack of capturing the mood, especially at dawn and dusk where he uses the deep oranges to good effect, letting them play their tricks on the steam and smoke. Some of the chilly morning photos nearly make me shiver, I can almost feel the cold bite of the frost.

About one half of the book has full page photos with the remainder being two, sometimes three and four (postcard size) photos to a page. Some of the full page photos are spectacular shots of the motive power at full cry. Others are quaint, capturing the quietness of a remote branchline to scenes varying from lushness to absolute barreness, all being served by the faithful steam locomotive, be it modern big power to an octogenarian ex-SAR pacific on the private lines ore trains.

The covering of the REGM garratts in the *Precious Metal* section appears to be a bit excessive and I get the feeling a little bit of padding was indulged in here.

Witbank Colliery remained steam operated until 1995 and a variety of mainly veteran (and some ancient) classes are shown doing the hard work .

The George to Knysna branchline (now a heritage steam line) gets extensive coverage, and deservedly so with its ever changing scenery. Classes 19C, 19D and 24 are the mainstay of operations here.

While over 30 different classes of locomotives are covered, as is to be expected the classes 15 and 19 get more than their fair share of attention. And so they should. They were two of the most numerous and successful classes of locomotives that the SAR had (as well as being very photogenic from all angles).

The captions for each photograph say enough. Where some lead up description or background explanation is needed, it is given without labouring the point.

A lot of the workings in this book are special runs, charters and the like. While the SAR (and its drivers) was renowned for keeping a lot of its fleet in spotless condition, some locomotives portrayed are obviously "tarted up" for the occasions and positively glisten along their flanks. While the purists may have a problem with this type of portrayal, it is a fact of life that as the numbers get smaller, those that remain get the royal treatment. Moore obviously doesn't have a problem with this as he uses the high finish on some of the trains and his photographic skills to almost lift them off the page as they show off.

Many readers may want to compare this book to some earlier productions, and draw their conclusions from this comparison. However, this reviewer thinks of it as a portrayal of the contemporary steam scene in South Africa, and on that basis Dennis Moore has more than adequately covered the subject.

The Video

This 105 minute film opens with the sole 26 class 4-8-4 flashing past on a freight. Then the music starts. Oh No! not again. Video producers world wide seem to have a pre-occupation with opening steam train footage with very sombre music. This one really takes the cake. The opening chords sound like the beginning of a "death march". South Africa still has over twenty classes of locomotives available for service, and most of these will be available into the new millenium. If this is not a reason to celebrate (and maybe the background music should reflect this) then I don't know what is.

The video reflects the book in that it also is broken up into seven themes.

The video picks up (and so does the music) with opening remarks on the presentation. The scenes follow the style of the book in content and subject composition. Nearly every scene is prefaced by a short narrative, which in a lot of cases mirrors that of the book. Most of the shots are 3/4 view run pasts — few pans are used.

The world famous *Red Devil* takes pride of place in one theme section with several passes of the locomotive working hard and fast on passenger and freights. The *Devil* is shown doing what it does best , "low flying" with a long and heavy (nearly twenty cars) *Orange Express* on the Kimberley to de Aar speedway. 3450 seems to revel in being driven hard and fast. The video certainly captures the spirit of this locomotive's performance, something that no book could.

The long legged poppet valved 16E's are shown (double headed too) and a 23 double headed with the 25 class condenser also get an airing. There are quite a few takes of the 25NCs. The sole 25NC converted to oil firing, 3501, gets a look in too.

Spectacular mountain views are brought to life in the film, 19Ds on Loots Berg Pass, GMAMs at Montague Pass, and not an unkempt locomotive to be seen. All are pristine. From the interior mountains to a Table Mountain background and a 15F accelerating a passenger consist away from Cape Town. Then back inland with GMAMs working in spectacular scenery. The ubiquitous 19Ds finish this section of the video off in fine style.

The *Transvaal Travellers* section opens with immaculate double 25NCs on the Trans Karoo Express. Later a GL Garratt gets its spot of glory on a mixed consist and Rovos Rail's splendidly restored carset is seen behind a pair of glistening 19Ds

Throughout this video many of the passenger trains are really long consists with the larger classes handling them singlehandedly. Naturally this meant hard

driving to keep the timetable, and this is seen and heard to good effect in the video.

The Randfontein and Rustenberg mines steam hauled trains are well covered. One unusual scene shows double 15Fs on a heavy waste train with another 15F banker on the rear (running backwards). A laboured coverage of the REGM garratts working the Cook 1,2 and 3 lines completes this section. A now sole surviving GEA garratt gets its time in front of the camera lens as well.

By this stage I must admit, the somewhat endless commentary was starting to get to me a bit. It doesn't just provide information in the background, it prattles on in the foreground. On some occasions I was given to think the locomotives' sounds were muted when there was commentary. I am afraid I am very much a believer of letting the locomotives do most of the talking. Its them who are on show, not the commentary.

The video flits between branch and mainline, from Alfred County narrow gauge garratts to modified front end 25NC 3454 on a passenger run between Blomfontein and Nourpoort.

The videographic quality is very good, the colours (especially morning and afternoon) are vibrant and the "feel" of the scene is unmistakeable. The video does one thing that the book can't. It brings those magical scenes to life.

In summary, as I said at the outset, the book/video presentation is a bold experiment in marketing. Seeing that this is a first, one must take the hat off to Moore and Vidrail for being game enough to try such an approach. It certainly is different. The video is can be purchased with the book, but not alone. However, if you just want the book only, it is available by itself.

Generally, South African Railways enthusiasts are very well catered for by a very good range of high quality books and videos and this pair make a useful addition to that portfolio. If you liked Dennis Moore's *Sunset of Steam* then you will like *Shimmer of Steel*. If you liked *Steam Fever* or *S.A. Winter Steam* then I think you will also like this video. Nuff said!

Shimmer of Steel

Prices: Book with Video $104.95. Book only $64.95. Prices include pack & post

Available from: AME Retail, P.O. Box 355, Kooringal NSW 2650. Phone & fax orders (02) 6926 4554

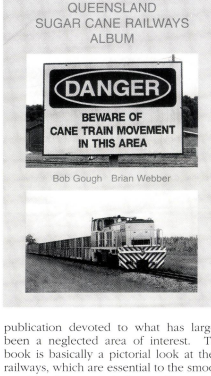
Neil Graham

Queensland Sugar Cane Railways Album

By Bob Gough and Brian Webber

48 pages, softcover with full colour front and back, 47 colour photos and 38 monochrome. Published by the authors

An aspect of railway operation which is rapidly growing in appeal to both enthusiasts and modellers is that of the Queensland sugar industry. *Queensland Sugar Cane Railways Album* is the latest



publication devoted to what has largely been a neglected area of interest. This book is basically a pictorial look at these railways, which are essential to the smooth running of the sugar industry. The authors are both well known among devotees of the cane railways — Bob Gough is a volunteer loco driver and general cane railway enthusiast, while Brian Webber has had many photographs published both in Australia and overseas.

On opening the book, the reader, once past the title page, will find a listing of all the Queensland sugar mills and statistics relating to acreage and crushing. This is followed by a short introduction and an overview of the industry, which includes some history and further statistics.

Page 8 sees the start of the photographic section which fills the remainder of the book, hence the name, album. The emphasis is on present day operation of the railways, but there are several shots relating to steam and earlier generation diesels as well. The standard of reproduction of the photos is generally very good, though some of the earlier ones are a bit fuzzy, which is understandable for the time. The captions are very informative.

Any profits from the sale of this book will go to the Australian Narrow Gauge Railway Museum Society (Durundur Railway) at Woodford in Queensland, where both the authors are members.

The book represents good value for money.

Queensland Sugar Cane Railways Album

Price: $19.50 (incl. post and handling)

Available from: Queensland Sugar Cane Railways Album, 365 Fairfield Road, Yeronga Qld 4104

David Proctor

PRODUCT REVIEWS

Prices stated in all product reviews are those quoted by the supplier and are current at the time of going to press.

News Desk

with David Proctor

I just got lost in thought. It was unfamiliar territory! Hello and welcome again to model engineering's leading magazine.

One of the more sombre aspects of any social activity like ours is when a close friend or someone we have come to respect over the years dies. AME receives many requests from club members and friends to publish **obituaries** or **memorials** for someone who is dear to them. Unfortunately, and as much as we would like to oblige, it is not practical to do this as, on average, we would have about three pages per issue taken up with such items. By way of the best compromise, it is **AME editorial policy** that we will only publish full obituaries for people who were well known nationally and who contributed to the hobby on a nationwide basis, either here or in New Zealand. The passing of all other hobbyists about whom we are advised, will continue to be acknowledged at the end of the *Club Roundup* section in each issue.

Melbourne model boaties

Regarding the request in *Newsdesk*, a couple of issues back, about the locations of model boat activities in Melbourne, I have received the following information from Tim Gay, the co-ordinator of the Wooden Boat Assoc. Inc., Model Boat Group. They participate in main club activities at Albert Park Yacht Club on the fourth Sunday as well as holding sail days at places like Cherry Lake (Altona), Williamstown Lake (rifle range estate), Westgate lakes (under the Westgate Bridge). Tim can be contacted on

buddiboats@hotmail.com

AME contact details

The AME office telephone number will mostly be **unattended until after 3:00pm** from now on to prevent the magazine taking over my whole life. At all times when the phone is unattended, you can leave a message on the answering machine and I will call you back after 7:00pm when the STD rates are cheaper.

I have repeatedly mentioned in the magazine for a year and a half now that the postal address for **AME** is **PO Box 21 Higgins, ACT 2615**. Why so many individuals and clubs persist in using old addresses has me puzzled, especially when they are sending in forms which only have the current address on them. Re-direction and forwarding of mail adds to our overall costs.

Subscription problems

When you pay by credit card please include the **expiry date** as we cannot bank it without this information. It is cheaper to mail the whole thing back to you than to phone you about it.

Could you also please fill in all the information requested on the subscription **renewal forms** you receive. If we can't read a signature on a cheque, or if the name on the cheque is different from the subscriber, how are we supposed to know whose it is? As an example, last year we received a cheque drawn on Queensland Quality Services as payment for a sub. and the only detail on the form was $32.00. There was no address on the envelope and we have no idea who sent it to us.

Anyone have a track code?

We have the Boiler Codes and the Wheel Standards, but one club wants to know, does anyone have a track code? Is there a need for one?

That's it for now. I'll leave you with this thought: *Eagles may soar, but weasels don't get sucked into jet engines.!*

Miniature railway for sale

- Owners changing to 2 foot gauge. All materials and vehicles for sale. All 7¼" gauge, also one 5" gauge partly constructed steam loco incl. Electric trams, wagons, engine powered locos. Made up track, etc. Will sell as whole or separate. Prices near material costs. Contact Ron (07) 3297 0682 or Graham (07) 3800 3396. (Featured in *Mixed Gauges at Park Ridge* on this issue)

7¼"gauge P class pacific

- Scale model, fine example, detailed loco. One of the best. For further details ph. (08) 9335 2646 (WA)

Metre gauge T class Bagnall 0-6-0 loco for sale

- 7¼" gauge, 1/5 scale, built to Jaipur (India) specifications with 6-wheel sit in tender to match engine. Refer to issue no. 3711 (1983) *Model Engineer* cover for picture. $15,000. Ph. (08) 8384 5915

Metre gauge Leopoldina Garratt for sale

- 2-4-2+2-4-2 7¼" gauge, 1/5 scale. Lentz poppet valves, vac brakes. Refer to AME issue 49 cover and article on valves. Award winning loco (Tullamarine 1992). Trailer and 2 articulated pass. trucks incl. $30,000. Ph. (08) 8384 5915

Books wanted

- *Railroading in the Tropics*, Vol 1 by John Kerr and *Building the Climax* by Kozo Hiroka. Ph. Noel (02) 4952 4477

Computer Indexes: ME now also available!

- 5+ yrs 1994 to date, same as AME, MEW, LS, EIM. $25 posted. See ad Issue 84. P Dawes, PO Box 758 Orange 2800

Traction engine castings & drawings

- For the 4½" scale Allchin, also Ransomes Sims & Jefferies (from works drawings) available to order. Drawings for 6"/4½" Burrell, 4" Foster, 3" Marshall. Fittings, valves, injectors, lubricators, steam sirens and whistles, rivets, etc. Please phone Peter Smith S.T.M. on (02) 4975 4548 day/night.

Miniature village for sale

- A magnificent tourist attraction in the premier seaside town of Victor Harbor, South Australia for private sale by expression of interest. The village is set in an award winning garden on level ground of 18 acres, highly suitable for a miniature railway. Thriving business includes modern tea rooms, gift shop, nursery & separate 3 bedroom residence. Further enquiries to PO Box 520, Victor Harbor 5211.

Steam launch for sale

- 18 ft. brand new on brand new trailer. $25,000 (08) 8536 2489

5" Baldwin 2-6-0 locomotive for sale

- Just completed, Briggs boiler certified to 5/2001, ride-on tender, excellent performance, $11,900. Ph or fax for further details. Philip Etherton (03) 5782 1639

5" gauge Metre Maid for sale

- Copper boiler, cert to Sept 2000, 18 months old. $4200 ono. Harold (03) 9795 9030

Victorian Railways rolling stock

- Now under construction for 5" gauge. Currently available are ZL goods brake vans, GY, IY and T wagons, ICIANZ specialised sulphuric acid bogie tankers. All wagons are painted, coded, individually numbered and 'Ready-to-Run'. Future projects include P, K, I and Q wagons, fuel oil tankers, AE, BE, diner, sleeping and observation passenger cars. For details and information contact Dennis or Erik at: Live Steam Locomotives & Rolling Stock, PO Box 492, Daylesford 3460 Vic or phone/fax (03) 5348 4135 or e-mail: steamers@netconnect.com.au

7¼" train for sale

- Motorised steam outline style engine, with 100m of track. Excellent condition, almost new. Suitable fetes, etc. $12,000. Ph. Richard (07) 3366 4012

7¼" model Australian EL class locomotive

- Powered by a Suzuki 3 cyc. 50cc petrol engine. Complete with traverser. Extremely good condition, very stable, very good hauling ability. Open to offers due to ill health. Ph. Steve (02) 6554 5152

7¼" loco parts for sale

- Copper boiler, superheated, 11" diameter, 4'6" o/all. Suitable large loco. Excell cond. Boiler certificate $2800
- Lucky Seven Don Young design, full set of plans, castings, wheels, cylinders, etc. $700. Phone Colin Campbell (03) 9796 8481

Wanted

- Copies of any videos or pictures taken during the convention involving the 7¼" double heading 38s or with the 36. Will meet any costs. Ph. Chris on (03) 5251 2677 any afternoon.

2½" live steam locos wanted

- coal or meths, rolling stock, wheels, rail etc. Geoff (03) 5974 3670

BA screws, nuts, BSF bolts, nuts, BA taps, BSF taps

- lathe tooling, drill bits, reamers, abrasives. The hard to get and unusual you are all looking for. A visit to out very central location is a must. Effpos welcome. Hardware Clearance Centre (Arnott's Factory), Gate 5/11 George St, Homebush (Nth Strathfield), NSW. Ph. (02) 9764 5755. Hrs: Tues to Fri 9am - 5pm. Sat/Sun 9am - 4pm

Subscribers Free Market

FOR SALE

Emperor twin cylinder engine with double base plate. Drawings (2 shts), set 40 castings. Cylinders 3/4 bore x 3/4 stroke. $250 Ph. Mike Stringer (Sydney) 0418 675 634

Complete **model engineer's workshop**, new machines, tools, castings, books, magazines, drawings. Phone for complete list (03) 9752 4065

Myford lathe 3½" with cabinet and access. Ph. John (02) 9791 0155

Don Young **plans Maxi Lucky** 7, 7¼", 19 sheets all laminated, never used. $180 ono. Ian (08) 9721 2034

5" R class steam locomotive incomplete with boiler and tested, plus club, smokebox, some wheels, patterns and plans. $1500. Ph. (03) 9885 2110

WANTED

7¼" 0-4-0 **motorised shunting type loco** to suit, if possible, 14lb rail Diamond Valley Railway, Eltham. Ph. Max Coleman (03) 9885 2110.

Manual or **operator's instruction book** for Milwaukee 11/2B vertical mill. 9 Smith Street, Macdon 3440. Ph.(03) 5426 1859.

Boiler for 3½" gauge Juliet loco, either new or second hand. Must have current certificate. Ph. Paul (02) 6649 2075

Plans, drawings, sketches. Anything to build 5" Stephenson's Locomotion. L Collis 17 Olive St, Ryde. NSW 2112 Ph.(02) 9888 1780

Three point steady and vertical slide for Hercus A, B, or C lathe. Ph. Michael (08) 9752 3573

Information about AMAC electric bandsaw blade brazer. Manual, circuir diagram, sales literature. Will pay all photocopying and postage costs. Ph. (03) 6244 8517

Vertical milling machine complete or incomplete. Ph. Frank (03) 5795 1551

Plan of Allchin 1½" scale traction engine TE 11/4. Loan or buy. Geoff Ph. (08) 9681 1028 Fax (08) 9681 1328

Two **large injectors and lubricator** for 7¼" gauge (2½" scale) loco. Also two ⅜" injectors. Colin Wear (02) 4997 4838

Classified rates

- $3.50 per line as published (including heading).Don't send payment with ad, we'll invoice you after publication. No limit to the number of words.

Subscribers Free Market conditions

- Non-commercial only, at the publisher's discretion.
- Maximum of twenty words, including your contact name, phone number or address.
- Posted, on special form provided. No faxes please.
- 5" gauge or larger locomotives (for sale) are not eligible.
- Only one entry per issue.

AME Retail

BOOKS

38	$65.00
50 Years of the Sydney Live Steam Loco Society	$11.50
Among Their Favourites	$37.95
Australian Diesel Scene 2	$27.00
Australian Diesel Scene 3	$32.00
Australian Steam Locomotives 1896-1958	$65.00
Away with Steam	$25.00
Bridges Down Under (soft cover)	$39.95
Byways of Steam - 7	$27.00
Byways of Steam - 8	$27.00
Byways of Steam - 9	$27.00
Byways of Steam - 10	$30.00
Byways of Steam - 11	$32.00
Byways of Steam - 12	$32.00
Byways of Steam - 13	$37.00
Byways of Steam - 14	$34.00
Compendium of NSW Steam Locomotives	$48.95
Essays in Steam	$37.00
Four Decades of Railway Photography	$39.95
Full Steam Across the Mountains	$39.95
Green Diesels - 40 and 41 classes (NSW)	$49.95
Locomotives in the Tropics - Vol.2	$35.00
Locomotives of Australia	$54.95
Man of Steam - E.E. Lucy	$35.95
Motive Power - Dev. of Modern Aust. Locos	$44.95
Rail Scene NSW Vol.12 (soft cover)	$39.95
Rails to Wealth - The Silverton Tramway	$47.95
Remember When	$59.95
Shimmer of Steel (book with 105min PAL video)	$104.95
Shimmer of Steel (book only)	$64.95
Standards in Steam - The 50 class (soft cover)	$39.95
Steam in the Sixties	$34.95
The 34 & 35 classes	$49.95
The 57s and 58s (3-cylinder power on NSWGR)	$54.94
The 60 class	$44.95
The Blowfly Manual	$49.95
Tracks in Time	$39.95

AME Safety Appliances

Vacuum Ejector $21.50

Videos

South African Winter Steam $44.95
A look at reopened narrow gauge ex South African line in the east of the country and various Garratts hauling heavy coal trains. 55 minutes.

Steam Fever $44.95
South African video looking at aspects of mainline work in the final days of steam. Incl. "Red Devil" and Class 25 condensing locomotive.

Superlatives In Steam $44.95
Shows some of the largest steam locomotives in preserved working order on US railways. Incl. Nickel Plate Berkshire 2-8-4 no.765, Norfolk and Western 'J' Class 4-8-4 no.611 and Norfolk and Western 'A' class Mallet no.1218. 1218 footplate and restoration Scenes included.

Challenger Through The Rocky Mountains ... $44.95
This video records the 1991 trip across the US by Union Pacific 4-6-6-4 Challenger no.3985 and 4-8-4 Northern No. 844 from Wyoming to Sacramento, California. Cold conditions add to the spectacle of preserved super power at work.

24 hrs. of Live Steam $24.95
An A M E production showing 5"gauge live steam locomotives in action hauling heavily loaded trains of between one and two tonnes on the Illawarra Live Steamers track at Wollongong. Action includes NSWGR 35, 36, 38, 50 and 59 class locos along with shots of Simplexes, Blowflys and Sweet Peas.

Magic of Steam $44.95
A 40 min. EK video look at East German preserved steam at work in revenue service during 1989.

Destiny of Steam $44.94
1970s footage of South Maitland Railways, A rare and historic insight into one of Australia's larger private railways. Duration: 60min.

Milestones in Railway Preservation (Australia) $54.50
Written and directed by Graeme Belbin, Qld's 130 year old A10 No.6, to a Victorian R class leading 3 diesels. 3830 and rare archival scenes — tripple headers out of Lithgow in the 1950s and black 3801's supposed last run. Duration: 90min.

Steam and Diesel Railway Review $44.95
NEW
Covers rail action of WA, SA, Tas, Vic, Qld & NSW. Digitally mastered and professionally narrated.

Steam Rails and Sugar Cane $44.95
NEW
Features historic footage (1957, 1966 &1968) of Qld's narrow gauge in the sugar growing area. Also QR steam and rail motors.

NEW

From Eveleigh Press...

Advance orders taken for August release date:

COACHING STOCK OF THE NSW RAILWAYS

A 260 page volume by David Cooke, Don Estelle, Keith Seckold. and John Beckhouse. Illustrations by Dennis Toohey

Covering in detail, the design, construction and operation of carriage stock on the railways of NSW.

The groups covered in **Volume 1** include:
The four- and six-wheel passenger stock, including brake vans, hearses, horse boxes and carriage trucks.
Early bogie cars including Cleminson, Redfern, Ashbury and others),
Express 'dogboxes' and their rebuilds including the L and P type cars).
The 72'6" cars, the twelve-wheelers, including Dental Clinic Car.
Miscellaneous Lucy-era cars including SBX, SFX and ACX.
Special cars including the state cars SO, GG and PAM, the Commissioner's train, Medical Officer's, etc.), horseboxes, prison vans and luggage vans (EHO).

Volume 2 will cover: steel-underframed and steel-bodied stock including American suburban cars, Pullman and Pullman-type cars, the FS/BS and N cars, the HUB and RUB cars, Southern Aurora cars, Indian Pacific cars, South Maitland Railway cars, VR standard-gauge stock relevant details such as bogies colour schemes and workshops.
Coverage is extensive: There is comprehensive tabular information on construction, conversion and condemnation dates for each individual car.
Illustrations include photographs of every available type and drawings.
This work has been over a decade in the making, and includes the latest research from original sources. It is the definitive work on the NSW passenger carriage, and is unlikely to be reprinted. This is a once-only chance to get the most complete work on NSW carriages ever offered.

$95 (per volume) posted within Australia

422 class loco drawings
$12.95 if purchased singly or $9.95 if two or more in the series are purchased at the same time.

Golden Arrow (steam launch) drawings 1:1 scale (1 sheet hull template & 1 sheet boiler) $14.95

The *Australian Model Engineering* ***Blowfly*** 5"gauge steam locomotive construction series by Barry Potter. Great value at only $49.95. Each page is protected in a plastic sleeve as a safeguard against the workshop environment!

All prices include postage and packaging Australia wide

Payment by cheque, money order, Bankcard, VISA or MasterCard to:

AME Retail

PO Box 355, Kooringal, NSW, 2650
Phone / Fax : (02) 6926 4554
http://www.ameng.com.au

Plough Book Sales

A History of Aircraft Piston Engines, 244 pages	$43.00
A. H. McDonald, Industrial Pioneer, 350 pages	$30.00
An intro to Low Temp Differential Stirling Engines	$22.00
An Introduction to Stirling Engines, 80 pages	$19.50
Australian Steam Power — Bi-Monthly magazine	$ 5.50
Cronicles of a Lancastrian Boilermaker by Alan McEwen NEW	$69.50
Diesel's Engine Vol. I, From Conception to 1918	$109.00
Guide for the Boiler Attendant's Certificate	$19.95
Hot Air Engines 17 patents from 1871 to 1959, 93 pages	$20.00
New Catechism of the Steam Engine (1904) 437 pages	$32.00
Old Marine Engines — The World of the One-Lunger	$56.00
Practical Distiller (1910), 156 pages	$18.00
Practical Notes on Hot Air Engines	$25.00
Steam Engine Design (1896), 150 pages	$19.00
Smoke Ash and Steam West Coast Steam Engines, 106 pages NEW	$33.00
The Development of the English Traction Engine & The Development of the English Steam Wagon (on same CD-ROM) NEW	$78.00
Windmills & Wind Motors (1910), 78 pages	$14.00
Bentley BR2 World War I Rotary Aero Engine, 1/4 scale	$35.00
Building Simple Model Steam Engines by Tubal Cain	$12.95
Building Simple Model Steam Engines Bk2 by Tubal Cain	$16.95
Building the Atkinson Cycle Engine, 94 pages	$29.00
Building the Henly 'Junior' Steam Engine	$ 4.50
Building the Stuart Beam Engine	$19.50
Gas Turbine Engines for Model Aircraft	$40.00
Ignition Coils and Magnetos in Miniature, how to build	$43.00
Machinery for Model Steamers, Boilers and Engines	$13.50
Model Boilermaking by E. L. Pearce	$16.50
Model Engineering, A Foundation Course, 408 pages	$39.95
Model Steam Turbines	$13.00
Model Hit and Miss Engine 1-1/8" bore 1-1/2" Stroke	$24.00
Model Petrol Engine by E.T. Westbury	$35.00
Model Petrol Engines — Design & Construction	$16.50
Model Stationary Engines, Their Design & Construction	$15.50
So You Want to Build a Live Steam Locomotive	$79.00
Steam and Stirling Engines You Can Build, 160 pages	$78.00
Steam and Stirling Engines You Can Build Book 2	$79.00
The Evolution of the Heat Engine by Ivo Kolin, 106 pages	$39.50
The Model Locomotive from Scratch by B. Terry Aspin, 92pp	$27.95
The Model Steam Locomotive, 208 pages	$34.95
The Sterling Engine Manual by James Rizzo, 195 pages	$70.00
Twin Cylinder Horizontal Steam Engine plans	$ 4.50
Modern Locomotive Construction 1892, 657 pages	$90.00
Valves & Valve Gears for Steam Locomotives	$33.00
Strictly I.C. Magazine (6 issue sub. $51)	$12.50
How to Build a Solar Cell that Really works	$ 9.20
How to Run Three Phase Motors on Single Phase Power	$ 5.75
Producer Gas for Motor Vehicles, 194 pages	$26.00
Sparks and Flames Ignition in Engines, 176 pages	$29.00
507 Mechanical Movements (1893), 122 pages	$15.00
Advanced Machine Work (1925 workshop), 800 pages	$50.00
American Wrench Makers by Kenneth L. Cope, 290 pages NEW	$43.00
Arc Welding Basic Fundamentals by J. Walker, 128 pages	$37.00
Around Will's Workshop the Restorers' Handbook	$29.00
Bent Iron Work & Art Metal Work by Hasluck, 160 pages	$20.00
Black Powder Manufacture Methods & Techniques, 160 pp	$36.50
Blacksmith Shop & Iron Forging, 96 pages	$15.00
Cronicals of a Country Works by Clark (CD-ROM version) NEW	$49.00)
Do it yourself Vacuum Forming, 125 pages	$27.50
Elements of Machine Work (1910), 191 pages	$38.00
Elementary Forge Practice by John Lord Bacon, 288 pages	$22.00
Forge Craft (1913) by Charles Philip Crowe, 175 pages	$20.00
Foundry Manual (1958 US Navy publication), 300 pages	$40.00
Gears and Gear Cutting, 136 pages	$16.95
Grinding, Lapping & Honing, 78 pages	$16.50
Handbook of Mechanical Design	$39.00
Hardening Tempering & annealing	$20.00
How to Build a Forge, 15 pages	$10.00
How to Forge Weld on a Blacksmith's Anvil, 50 pages	$19.00
How to Run a Metal Working Shaper & Drill Press, 48 pp	$14.00
Indexing Tricks (1903 milling machine work)	$ 8.00
Ingenious Mechanisms for Designers Vol. 1, 536 pages	$59.95
Lapping & Polishing by E.K. Hammond	$12.50
Lathe and Planer Tools (1908), 40 pages	$ 8.00
Machine Shop Methods by Lorus J. Milne , 376 pages	$38.00
Lil Bertha Electric Furnace, 67 pages	$18.00
Machine Tool Adjustment, 47 pages	$12.00
Machinery Handbook, 2511 pp $159.00, Large print ed.	$185.00
Manual of Blacksmithing by John R. Smith (1902)	$19.95
Melting & Casting Aluminium (1925), 253 pages	$18.50
Milling Machine Practice (Cincinnati), 28 pages	$ 8.00
Modern Metal Working by John R. Walker, 528 pages	$77.00
Modern Toolmaking Methods (1915), 309 pages	$26.00
New Edge of the Anvil A Resource Book, 243 pages NEW	$59.50
Pounding Out the Profits, forge hammers, 316 pages	$80.00
Practical Blacksmithing & Metalworking, 360 pages	$41.95
Practical Lessons in Metal Turning & Screwcutting	$28.00
Secrets of Building a Plastic Injection Moulding Machine	$29.00
Shapers by Emanuele Stieri (1942), 180 pages	$17.50
Simple Workshop Devices by Tubal Cain, 140 pages	$16.95
Sir Charles Joseph Whitworth 'The World's Best Mechanician'	$50.00
The Backyard Foundry by Terry Aspin, 90 pages	$16.95
The Beginners Guide to the Lathe by P. Marshall	$16.50
The Care and Operation of a Lathe (1942), 105 pages	$15.00
The Complete Handbook of Sand Casting by C.W. Ammen	$34.95
The Cupola Furnace by Edward Kirk, 459 pages	$58.00
The Machinist's Bedside Reader, Projects, hints, tips	$38.00
The Machinist's Second Bedside Reader by Guy Lautard	$39.95
The Machinist's Third Bedside Reader by Guy Lautard	$49.95
The Metalcaster's Bible by C.W.Ammen, 434 pages	$47.95
Treatise on Milling and Milling Machines (1919)	$28.00
Turning Lathes: A Guide to Turning, Screwcutting, 432 pp	$44.00
Universal Milling Machines, 94 pages	$12.00
Zeus Precision Data Charts and Reference Tables	$10.50

We handle many other modeling, railway and metalworking books from the UK and the USA for a complete catalogue of over 6000 titles please send $2 (Payment may be by postage stamps).
Please allow 12-15 weeks delivery for some items. Payment can be made by Bankcard, VISA card, Mastercard, cheque or money order to:

Plough Book Sales
PO Box 14, Belmont, VIC, 3216
Phone (03) 5266 1262 Fax: (03) 5266 2180

Postage and Handling Charges

Order Value	Postage Charge
$0 - $10	$2.50
$10 - $20	$3.00
$20 - $50	$5.00
$50 - $150	$9.00
Over $150	Free